EXPORT NUMBER

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied field. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

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UNIVERSITY OF TORONTO

SABEN

SaBeN ExTrA
HIGH SPEED STEEL

SABEN

The most economical and efficient steel for machining shells

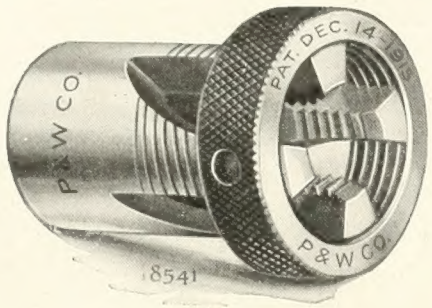
Manufactured by Sanderson Bros. and Newbould, Limited, Sheffield, England

H. A. DRURY COMPANY LIMITED
MONTREAL TORONTO NEW YORK

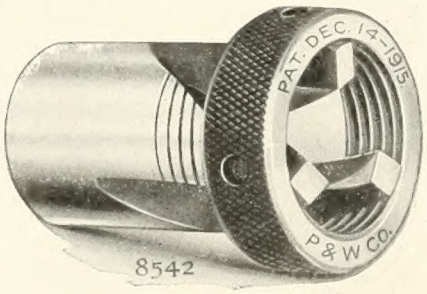
SMALL TOOLS

Taper Thread Adjusting Collar

Insures Uniform Concentric Adjustment



Spring Screw Die



Hollow Mill

P. & W. Spring Screw Dies and Hollow Mills

Advantages of the Taper Thread Adjusting Collar

Ease and delicacy of adjustment to FINE LIMITS are secured without trouble and loss of time.

All lands or prongs of the die or hollow mill are adjusted in or out exactly the same amount by merely turning the collar, thus giving rise to the term CONCENTRIC ADJUSTMENT.

This concentric adjustment results in each land or cutting edge doing its proper share of work, and as a perfect circle is always maintained, accurate results are assured.

By having the bearing always on the point, there is no tearing while backing off, and the correct amount of clearance is obtained.

Write for 4-page descriptive Circular giving size and dimensions.

Precision Machine Tools, Standards & Gauges

PRATT & WHITNEY CO.

of Canada, Limited

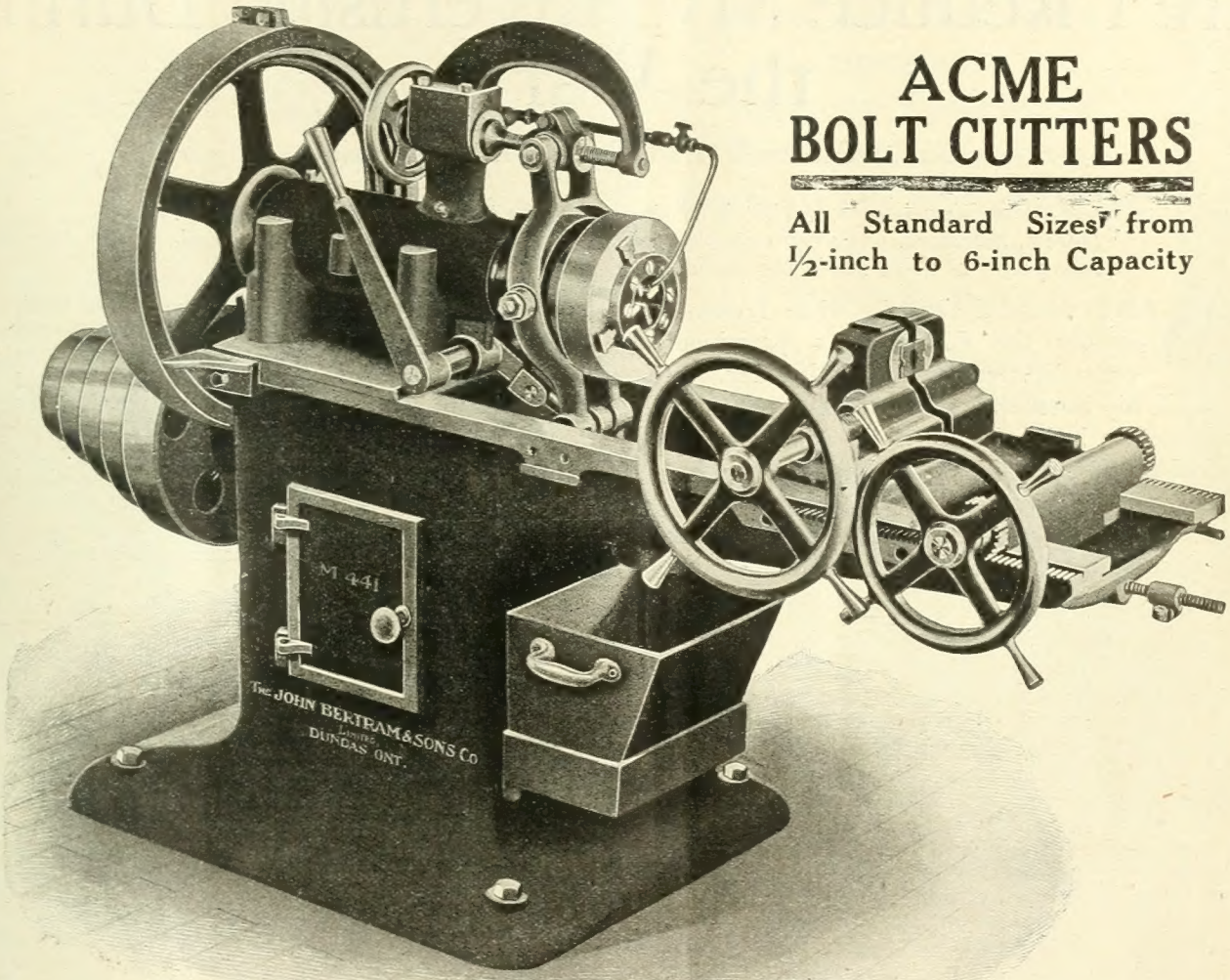
Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

ACME BOLT CUTTERS

All Standard Sizes from ½-inch to 6-inch Capacity



Supplied with Leadscrew Attachment for Stay Bolts or other work requiring special Accuracy of Pitch.

WRITE US FOR FULL DETAILS ON ANY MACHINE OR MACHINES IN WHICH YOU ARE INTERESTED

The John Bertram & Sons Company Limited

Dundas, Ontario, Canada

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Publisher's Page

TORONTO July 5, 1917

Dare I Reduce My Advertising During the War?

GEORGE F. TILTON, In 100% Magazine

Advertising is a force that is so stupendous as to be almost immeasurable. Dare I, therefore, underestimate the results of shutting off this wonderful business power at this time in the world's crisis?

"WHY should I advertise when I cannot supply the demand?" a prominent manufacturer wrote the other day. In some of his lines the raw materials positively could not be had. In others the supply was so limited as to make the price almost prohibitive. Then, with next to nothing from which to manufacture his finished product, why should he spend any money advertising a commodity that cannot be bought?

This problem is uppermost in the minds of thousands of manufacturers. We admit that on the surface there seems to be but one answer, and were you running a corner grocery store and were you depending only on the immediate neighborhood for your income, it would be easy to solve your problem.

But how about you big manufacturers, you who realize the gravity of the situation, you who have been spending millions in advertising that has helped to make this country the most wealthy nation in the world; are you willing to trifle with this powerful business agent?

Hasty decisions based on fears and apprehensions often lead to business oblivion.

American business has reached a place in its progress where, if it desires a successful future, it must make haste slowly.

Have you measured and do you know just how much of your success you owe to advertising?

Copy the following questions. They may be worthy of deep consideration:

(1) Have the results of my advertising in the past been only temporary? In other words, have I advertised only for immediate returns or for the accumulation of good will?

(2) What will I lose in good-will by not being able to supply the goods I advertise?

(3) If I stop advertising for one year how much will it cost me to restore my sales impetus to its normal momentum?

(4) How much will my organization be affected and how long will it take me to build it up after the war?

(5) By shutting off my advertising am I not leaving the way clear for new concerns to be organized that will have an equal chance with me to get my business after the war?

(6) How long will my business run without advertising?

(7) How are my competitors going to meet this crisis?

Some manufacturers believe that business is going to be harder to get after the war and are far-sighted enough to increase their advertising in anticipation of that dull period. If business is going to be harder to get after the war, now is the time to make friends with the public and win a consumer market.

All periods of prosperity are followed by an aftermath of business depression—a time when people not only become frugal—they become niggardly. Is there a business force so well equipped to overcome the bad effects of panics and depressions as advertising?

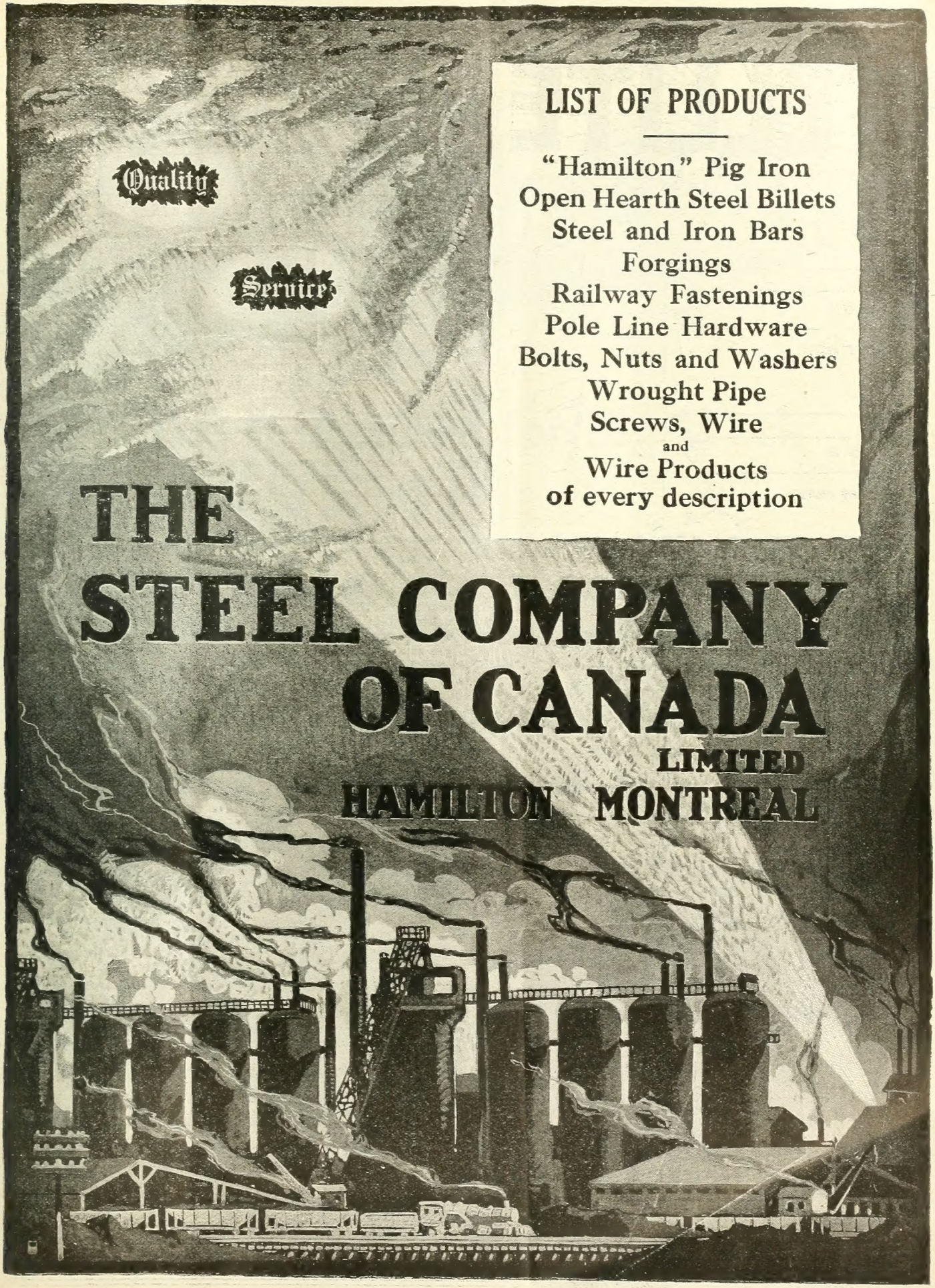
To some people there seems to be a vast difference between "economy" and "elimination of waste." Economy and frugality mean "management without loss or waste" and have nothing to do with **excessive hoarding.** Judicious spending is just as important as the elimination of waste. Depressions and panics are not overcome by niggardliness and parsimony.

Let us not get these terms confused. Let us economize if we must, but let us start where economy is essential. Let us discriminate in favor of **efficiency.** Let us study our manufacturing costs; our overhead; our depreciation; our method of manufacture.

The business of the nation is no stronger than its internal business, and the manufacturers who are looking forward to the securing of international markets after the war cannot hope to succeed if the nation is confronted with an internal panic because of lack of foresight at this time in reducing its advertising.

You manufacturers who have been enlarging your plants and increasing your production during the recent time of prosperity had better be making new efforts and building a new consumer demand for the time when business is not going to be easy to get.

Advertising **now** will make your future secure.



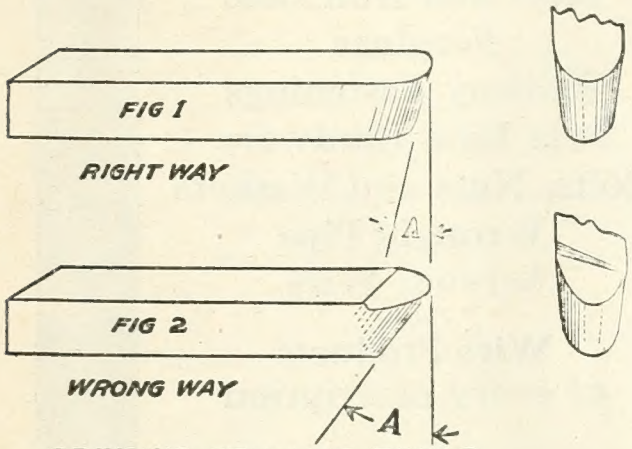
If any advertisement interests you, tear it out now and place with letters to be answered.

STELLITE

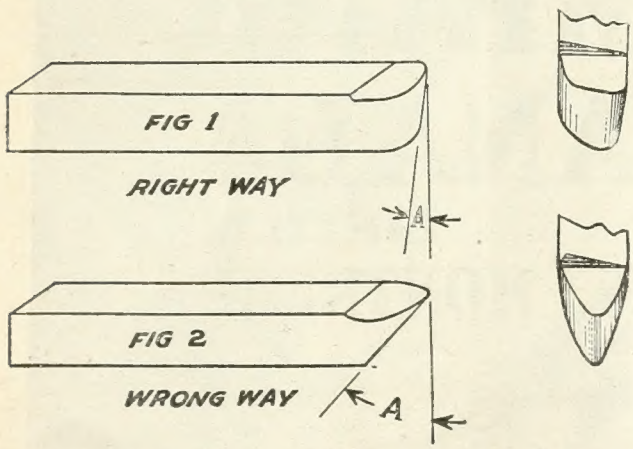
IS NOT STEEL, SO DO NOT ∴ USE IT LIKE STEEL ∴

DIRECTIONS FOR GRINDING

"STELLITE" TOOLS



GRINDING STELLITE TOOLS FOR CAST IRON



GRINDING STELLITE TOOLS FOR 20 TO 100 POINT CARBON STEEL

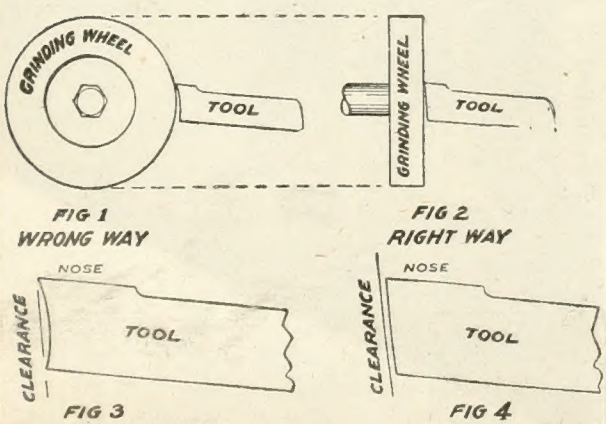


Figure 1 shows the right way to grind a Stellite tool for machining Cast Iron. Give the tool a full Round Nose, and be sure the angle (A) is just sufficient to allow the tool to clear the work. This angle should never be more than six degrees.

Whenever possible, operate the tool without top slope as shown in Figure 2, since the centre of the Stellite bar is not as hard as the outer surface.

Figure 2 shows the improper way to grind the tool. Angle A is entirely too great, and will cause the tool to crumble. This tool should have a full round nose, and the top slope as shown will reduce the cutting qualities of the tool.

Stellite tools cannot be burnt while grinding, because they have no temper. They always remain hard.

Always use No. 3 grade Stellite for turning Cast Iron.

Figure 1 shows the right way to grind Stellite tools for grinding steel. Angle A should be just sufficient to allow the tool to clear the work, and should never be more than six degrees. In turning steel it is necessary to give the tool some top slope to get the proper cutting action between tool and chip. It will be found that due to the high rate of speed at which the Stellite tools operate it requires less top slope than is generally given other tools. A top slope angle of 5 degrees is sufficient.

Figure 2 shows wrong way to grind for turning steel, as Angle A is too great and the shape of the cutting nose is too pointed. The top slope, as shown in figure 2, is too great.

Always use No. 2 grade Stellite for turning 20 to 100 point Carbon Steel.

In Figure 1 the Stellite tool is being ground on the periphery of the grinding wheel, with results as shown in Figure 3. This method is wrong, because a concave clearance is given the tool, as shown, which robs the cutting edge of its maximum support, causing crumbling and failure.

In Figure 2 the Stellite tool is being ground correctly, using the side of grinding wheel. This method gives maximum support to the cutting edge as shown in Figure 4.

Tools ground, as shown in Figure 3, will always give trouble, and are responsible for most failures with Stellite tools.

Never give Stellite tools any more clearance than absolutely necessary.

Always remove the wire edge with a carborundum or oilstone.

Stellite cuts 25% to 300% faster than the best tool steel.

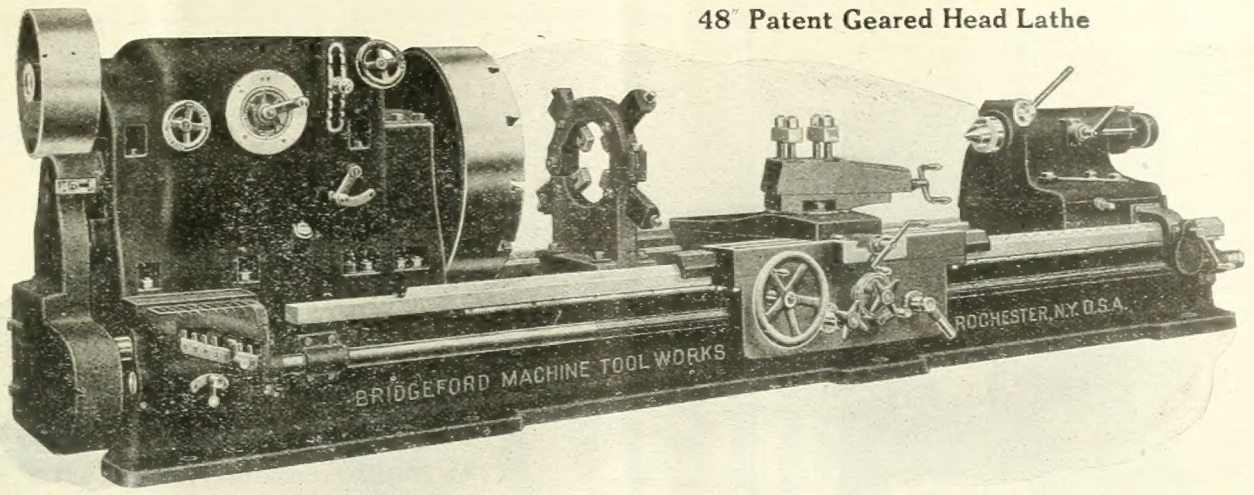
CANADIAN MANUFACTURERS

Deloro Smelting & Refining Co., Limited

DELORO, ONTARIO

Branch Warehouses - TORONTO and MONTREAL

48" Patent Geared Head Lathe



The Bridgeford for Big Work

That's what this powerful Bridgeford is built for—big work. Has strength and rigidity sufficient to perform the heaviest kind of jobs with perfect accuracy—and it goes through them in record time. Smooth in action. Strongly constructed. Fifteen cutting speeds all easily changed.

Bridgeford's Lathes give maximum production at minimum cost. We'll be glad to give you a full account of what they will do. Write

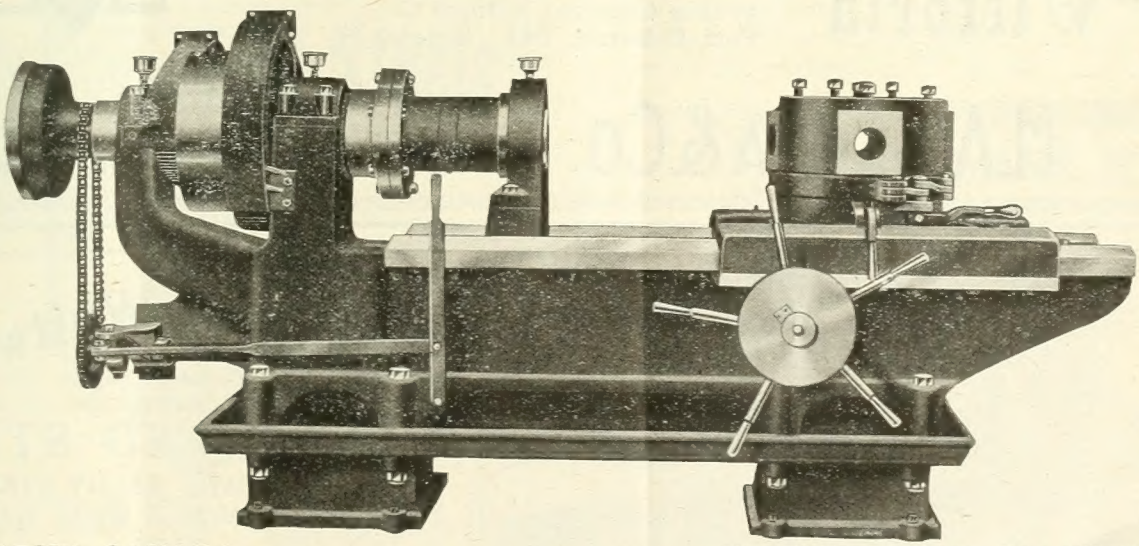
Bridgeford Machine Tool Works, Rochester, N.Y.

161 WINTON ROAD

IN STOCK—FOR IMMEDIATE SHIPMENT

SUBJECT TO PRIOR SALE

H.E.W. Boring Lathes To Handle Shells Up To 6"



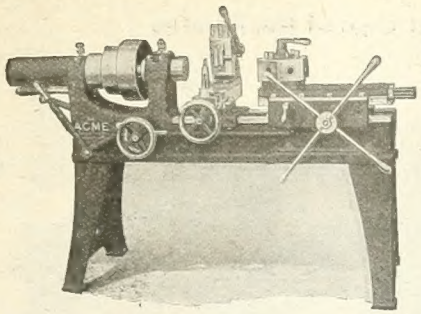
MADE IN CANADA *SPECIFICATIONS ON REQUEST*

HYDE ENGINEERING WORKS

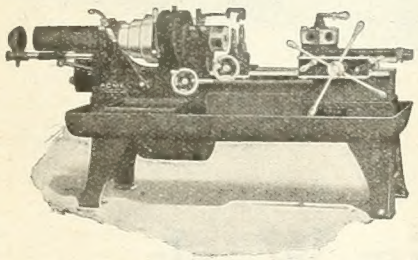
CONSULTING AND MANUFACTURING ENGINEERS

P.O. Box 1185 27 William Street, MONTREAL, P.Q.

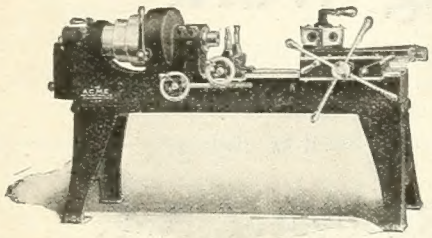
If any advertisement interests you, tear it out now and place with letters to be answered.



16″ Forming Turret Lathe



2¼″ x 11″ Screw Machine



18″ Turret Lathe

Satisfaction in Cincinnati Acme

The Cincinnati-Acme machines have, by their achievements, proven their sterling worth. Time and experience, coupled with equipment, alone has accomplished this.

The Screw Machines are made in five sizes 11″ to 20″ swing, ⅝″ to 2¼″ capacity. The Turret Lathes are made in four sizes, 14″ to 20″ swing.

It would be a good move on your part to inquire for full information.

THE ACME MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.
Code Word ACME
Canadian Agents:
RUDEL-BELNAP MACHINE CO.
Montreal Toronto

PIG IRON

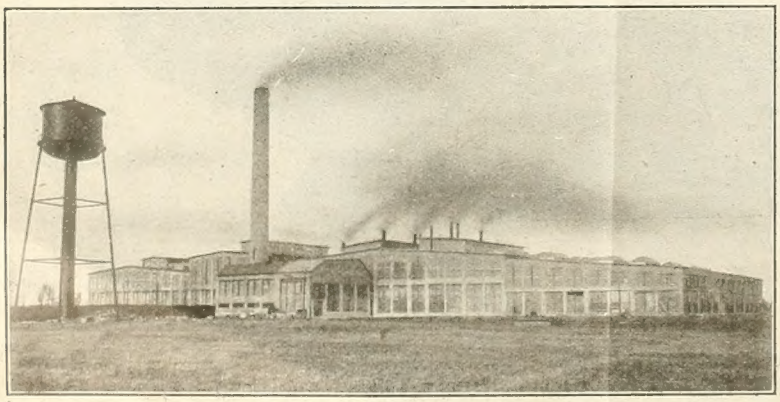
"Victoria"

Foundry and Malleable, made by The Canadian Furnace Co., Port Colborne, Ont., Canada.

M.A. HANNA & Co.

M·A HANNA & Co

Sales Agents:
Toronto
Cleveland, Buffalo, Pittsburgh, Detroit



Works: LONGUEUIL, QUE.

Armstrong Whitworth
of Canada, Limited
MANUFACTURERS OF
HIGH SPEED STEEL
CARBON AND ALLOY STEEL
MISCELLANEOUS SHOP TOOLS

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

All Products "MADE IN CANADA"

Steel Castings

No castings too small or too large for the capacity of our plant. Manganese, Vanadium, Titanium, Chrome, Nickel, castings for Marine, Railroad, Mill and hydraulic purposes are our specialty. Made true to specifications and pattern.

Illustration above shows Stern casting for Ice-Breaker, "John D. Hazen."

CANADIAN STEEL FOUNDRIES, LIMITED

Montreal, P.Q. Welland, Ont.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" Tool Steels

SISCO

Made in Sweden from selected Dannemora Ore

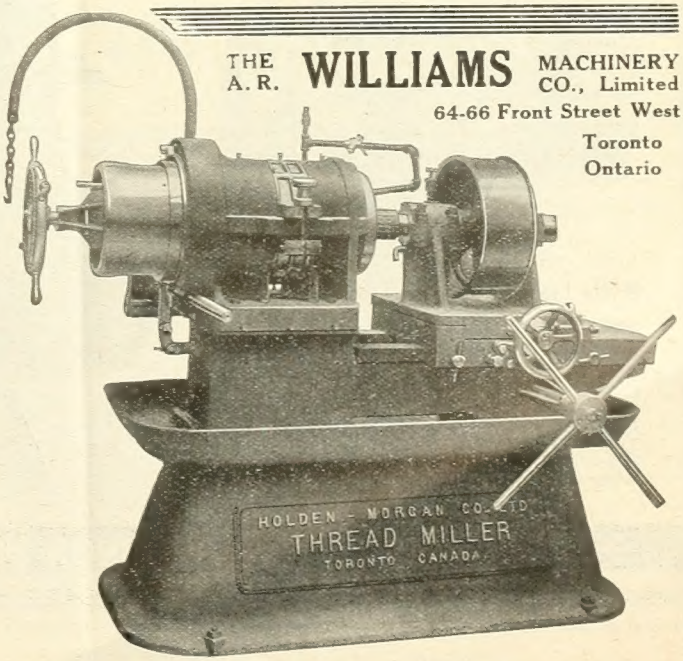
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

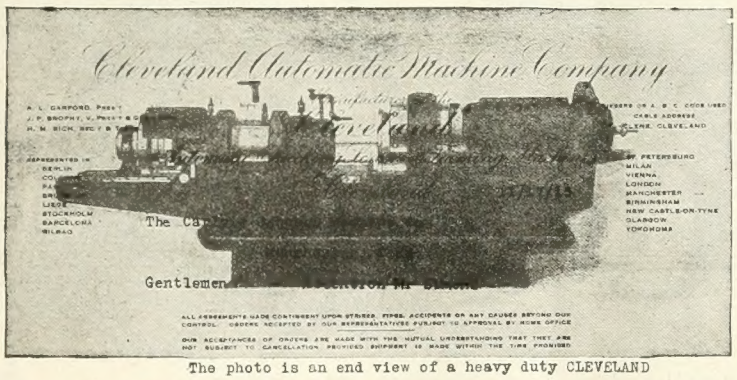
Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A. R. WILLIAMS MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario



THE JOHNSON FRICTION CLUTCH

A Good Test of Clutch Efficiency



The photo is an end view of a heavy duty CLEVELAND showing position of the Johnson Clutch "A" in the feed mechanism.

The clutch sleeve B is connected by means of miter gears to the feed pulley C and when the clutch is engaged, it transmits the constant high speed idle movement of the machine for indexing, etc.

The clutch A is engaged and disengaged automatically several hundred times during a day by means of adjustable pins D through the lever action shown.

Service of this kind requires a friction clutch of correct design and the Johnson Clutch proves entirely satisfactory in this application.

Yours truly

CLEVELAND AUTOMATIC MACHINE CO

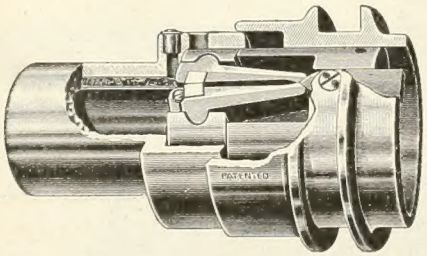
J. P. Brophy

JPB EN

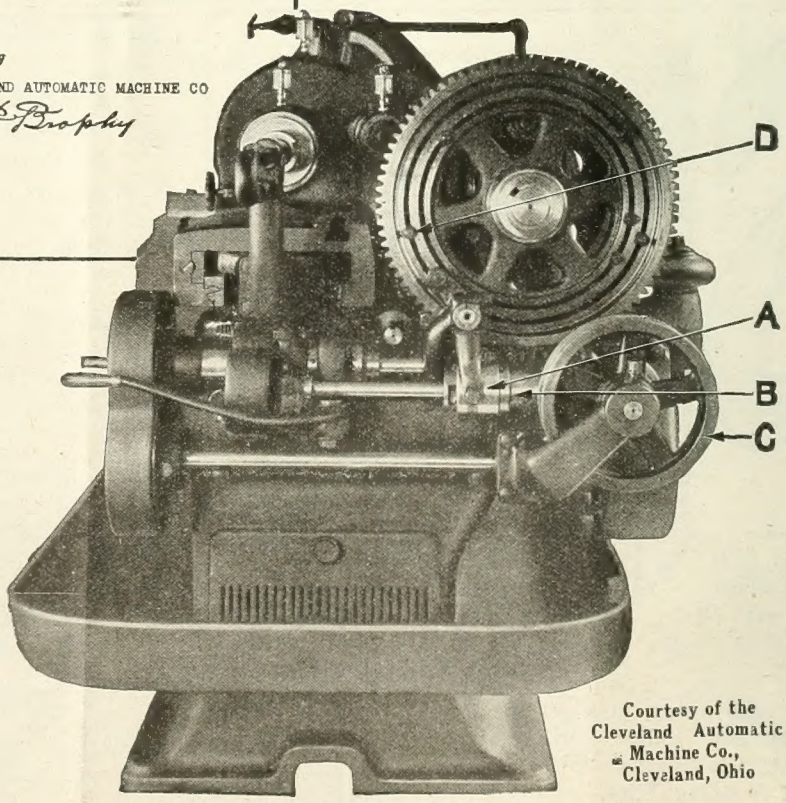
Mr. Brophy, of the Cleveland Automatic Machine Co., knows what the market offers in the way of clutches, and his decision is reached only by process of elimination.

Note what he says about the Johnson Friction Clutch embodied in the Cleveland Automatic.

By the way, are your clutches giving entire satisfaction? If not, let us get together and solve your problems—free.



Section broken away, showing clutch disengaged.

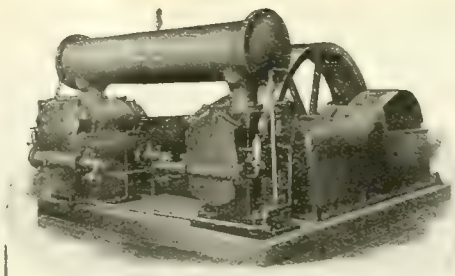


Courtesy of the Cleveland Automatic Machine Co., Cleveland, Ohio

Write for our YELLOW DATA SHEETS and our latest free booklet, "CLUTCHES AS APPLIED IN MACHINE BUILDING."

ENGLAND: The Efandem Co., Ltd., 159-165 Gt. Portland St., London, W., Sole Agents for British Isles. CANADA: Williams & Wilson, 320 St. James Street, Montreal. Canadian Fairbanks-Morse Co., Ltd., Toronto. AUSTRALIA: George Wills & Co., Brisbane, Queensland.

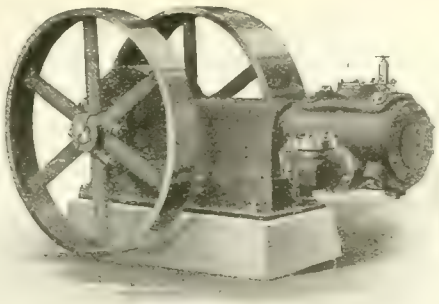
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



JENCKES CLASS DB-2 AIR COMPRESSOR

If you understand compressors look over the following outline. If you are not acquainted with these machines it would delight us to give you an introduction.

Inlet Valves are of the Corliss type, the outlet valves of the disc type; flood type lubrication, allowing a continuous flood of oil over bearings, crank pins, etc., while in motion. Machine of the enclosed type.



JENCKES CLASS CB-1 AIR COMPRESSOR

If your requirements do not justify either of the above machines, just bear in mind that we have a very comprehensive range that will cover all usual and unusual needs. The above is equipped with inlet and outlet disc valves; splash gravity lubrication system; extra large bearings; machine entirely enclosed.

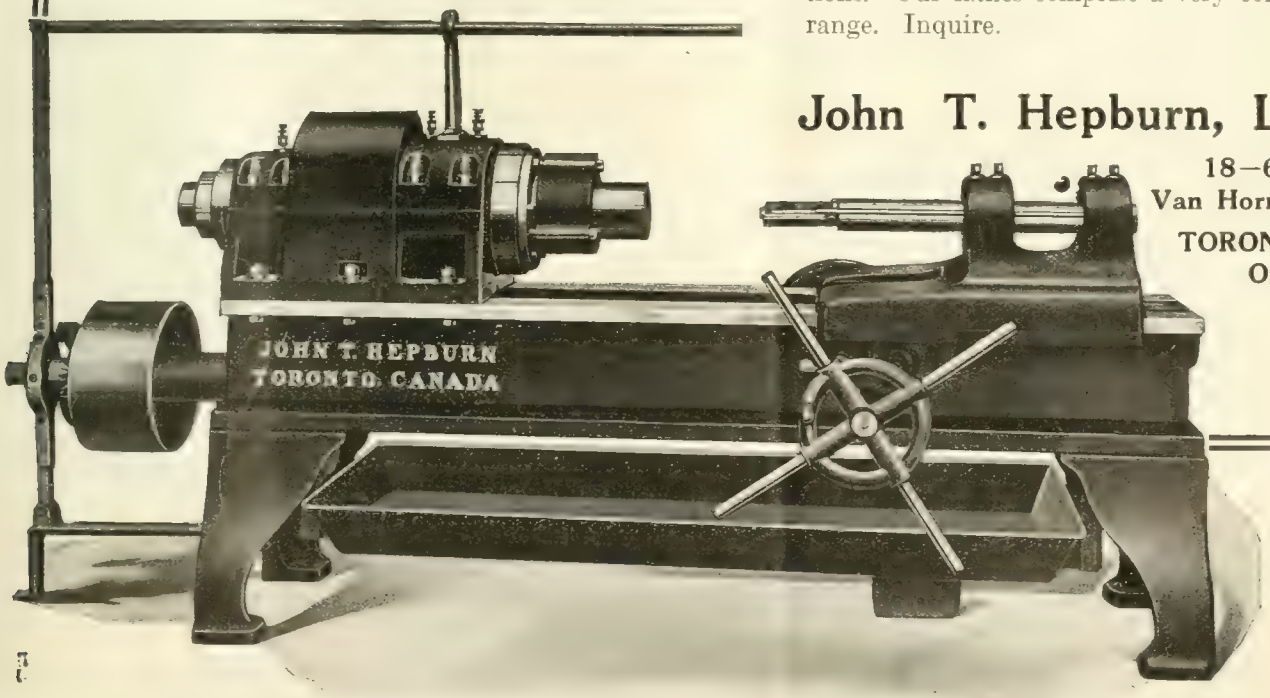
The Jenckes Machine Company, Limited

Works: St. Catharines, Ont.
Works: Sherbrooke, Que.

SALES OFFICES: 710 C.P.R. Bldg., Toronto; 908 E.T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.; Exchange Bldg., Vancouver.

DOES IT FIT YOUR REQUIREMENTS?

A 6″ Boring Lathe of exceptional strength. The strong driving gears, the convenience and speed of the tailstock and pilot wheel; these features make you stop. While stopping drop us a card for complete specifications. Our lathes comprise a very complete range. Inquire.



John T. Hepburn, Ltd.

18—60
Van Horne St.
TORONTO
Ontario

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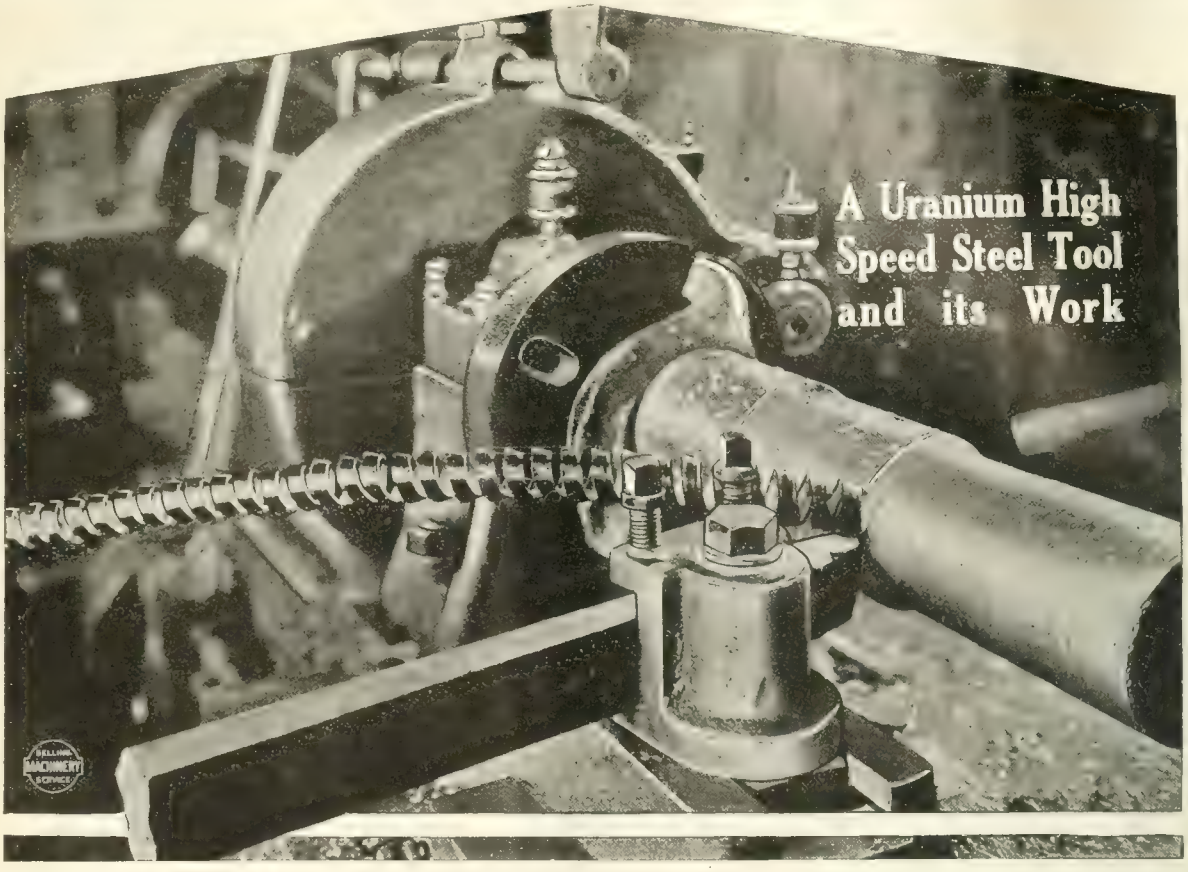


FOR BETTER TURNING TOOLS SPECIFY

URANIUM
HIGH SPEED STEEL

ITS use in high-speed turning tools means longer service between grinds, the ability to stand heavier cuts and coarser feeds and greater "all around" economy. The photograph shows a Uranium Steel Tool, one inch by two inches, turning a heat-treated steel shell forging 4.5″ diameter, taking a quarter-inch cut at a feed of 7/32″ per revolution. The chip coming off is so tough it can hardly be bent with the hands.

If you want better service from high-speed steel tools, regardless of the work they do, specify Uranium High-Speed Steel. Improvement will date from the first job they finish.

Consult your steel man or write us.

STANDARD ALLOYS COMPANY

Forbes and Meyran Avenues, Pittsburgh, Pa.

Sheet Metal Working Machinery

of any description

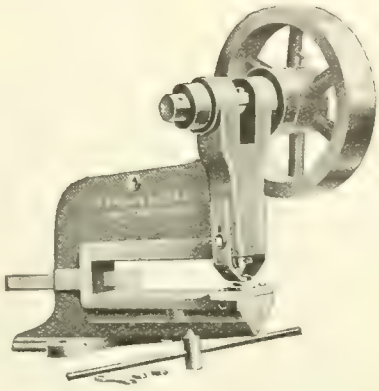
NO 7 SCREW PRESS

For

Quality Efficiency

Durability Speed

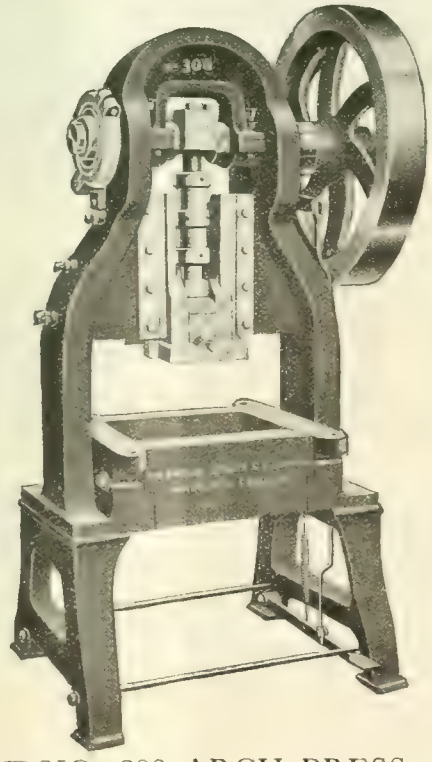
they are unsurpassed.



NO 100 GEARED
POWER PUNCH

The Brown, Boggs Company, Limited

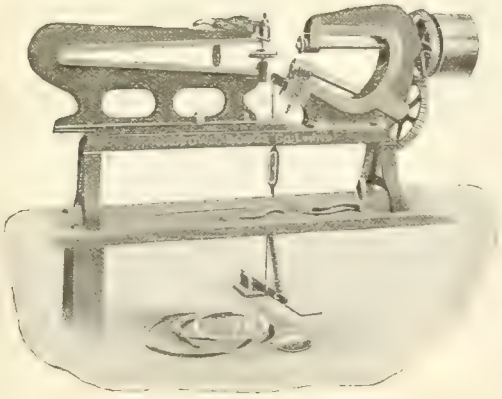
Hamilton, Ont.



NO. 300 ARCH PRESS

Manufacturers:

Tinsmiths', Heavy Sheet Metal Working Machinery, Canners' and Evaporating Machinery.

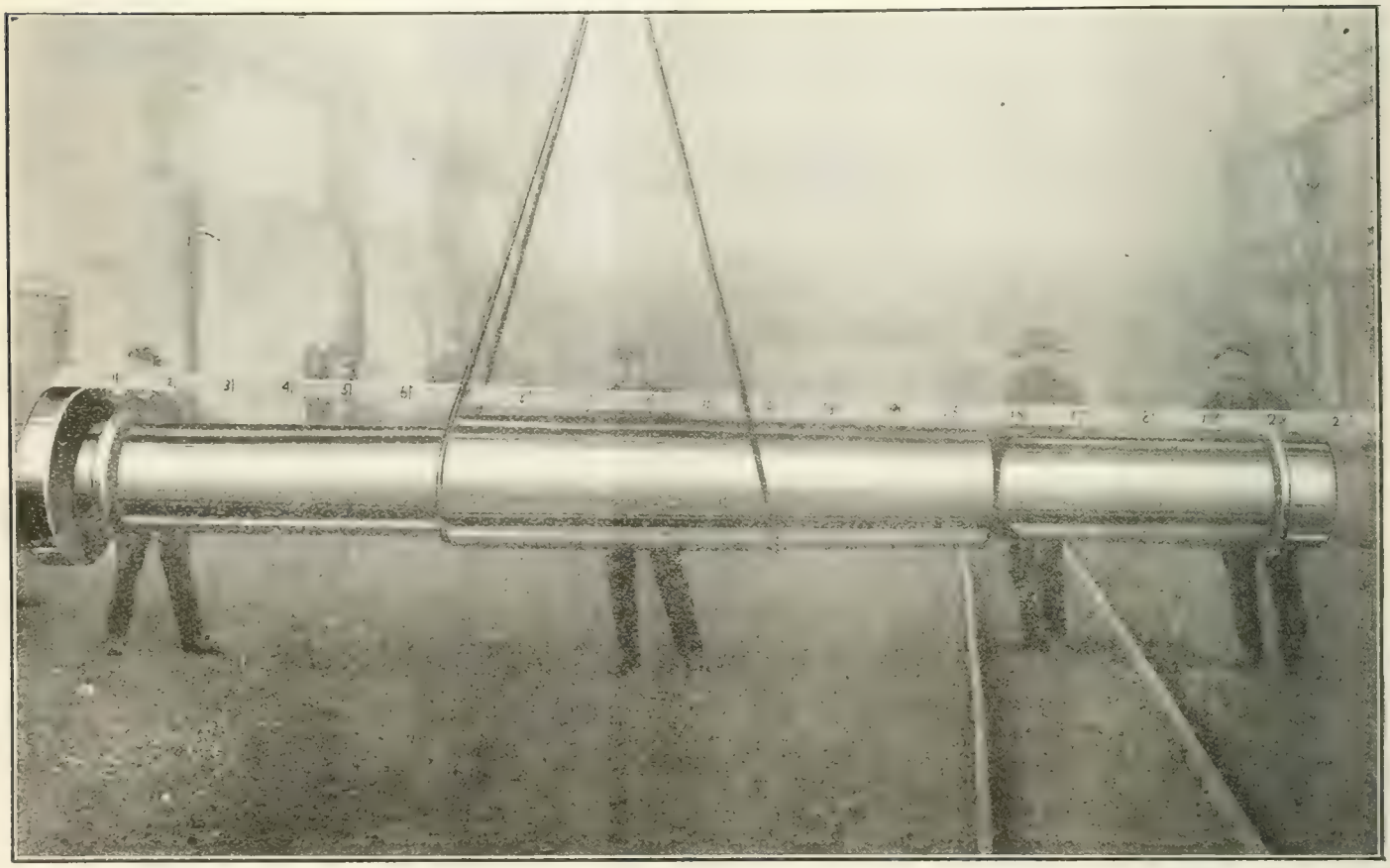


NO. 6 COMBINED
RING and CYLINDER SHEARS

If any advertisement interests you, tear it out now and place with letters to be answered.

Nova Scotia Steel & Coal Company
Limited

New Glasgow, Nova Scotia, Canada

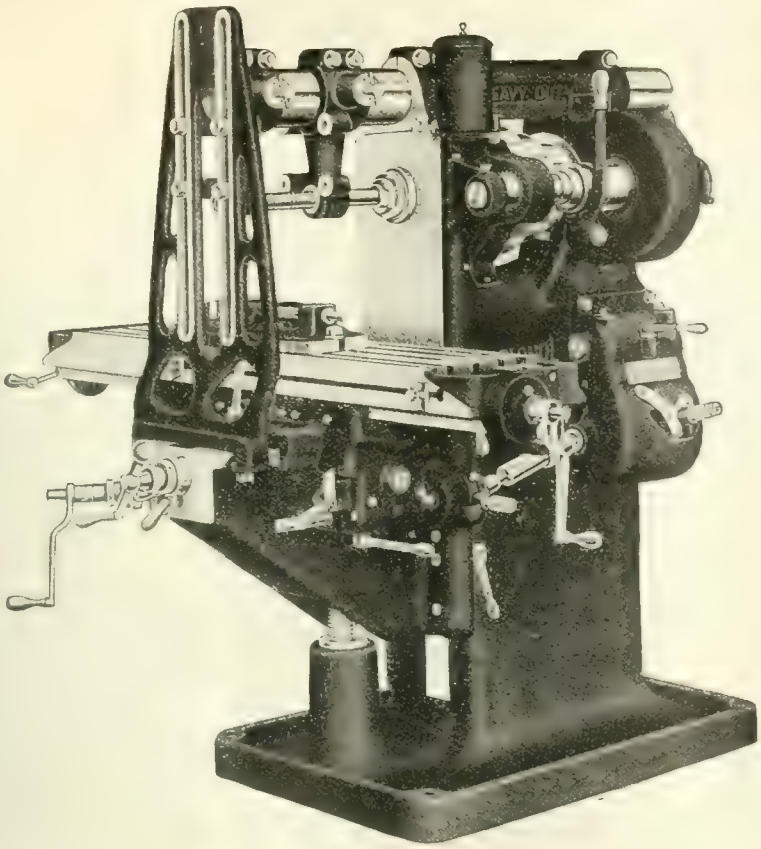


FINISHED COUPLING SHAFT, 18 IN. DIAMETER BY 21 FT. LONG.

Heavy Marine Engine Forgings in the Rough or Finish Machined

Our Steel Plant at Sydney Mines, N.S., together with our Steam Hydraulic Forge Shop and modernly equipped Machine Shop at New Glasgow, N.S., place us in position to supply promptly Marine Engine Crank and Propeller Shafting, Piston and Connecting Rods; also Marine and Stationary Steam Turbine Shafting of all diameters and lengths, either as forgings or complete ready for installation, and equal to the best on the American Continent.

Mention this paper when writing advertisers. It will identify the proposition about which you require information.



LeBLOND
Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—Hardened Steel Spindle Bearings—Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

The R. K. LeBlond Machine Tool Company

CINCINNATI, OHIO, U.S.A.

Two Cuts at One Time

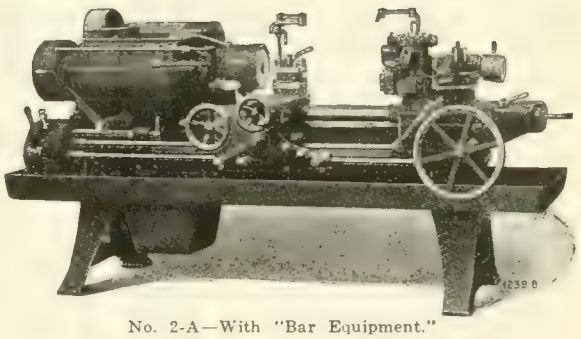
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

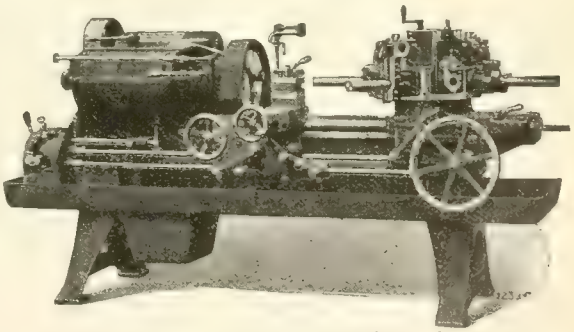
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



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THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal; Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

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	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
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CHROME VANADIUM, oil hardening or case hardening
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Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

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We carry a complete stock at our Montreal Warehouse

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Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.
We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.
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High Speed Steel

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A Keen Cutter

WOLFRAM *Is Both*

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Aliquippa ESTABLISHED 1900 Pa: U.S.A.
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Strong in the Neck

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

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and GENERAL MACHINERY SUPPLIES

For Export and Import—

Iron — Steel — Metals

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A. G. KIDSTON & CO.

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AUSTRALIA NEW ZEALAND SOUTH AFRICA

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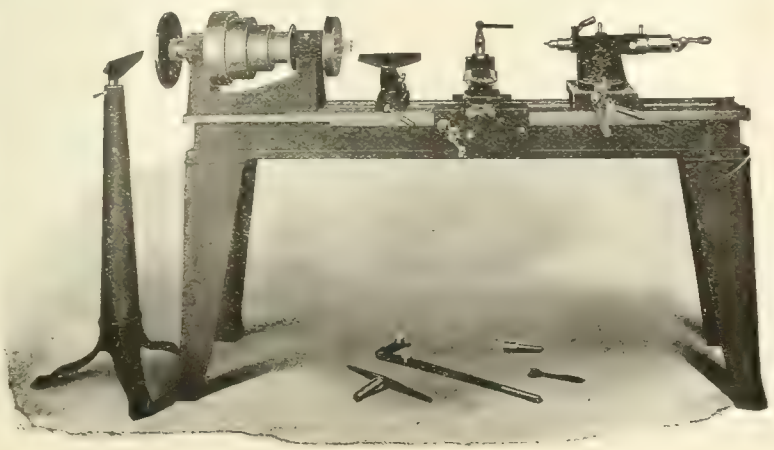

A Favorite--

Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
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ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK

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Reliance Steel Works
SHEFFIELD, ENG.

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of the Famous

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Brand

High Speed Steel and Twist Drills

"DOUBLE WACO" Quality

Specially Adapted for all kinds of
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For particulars apply to our
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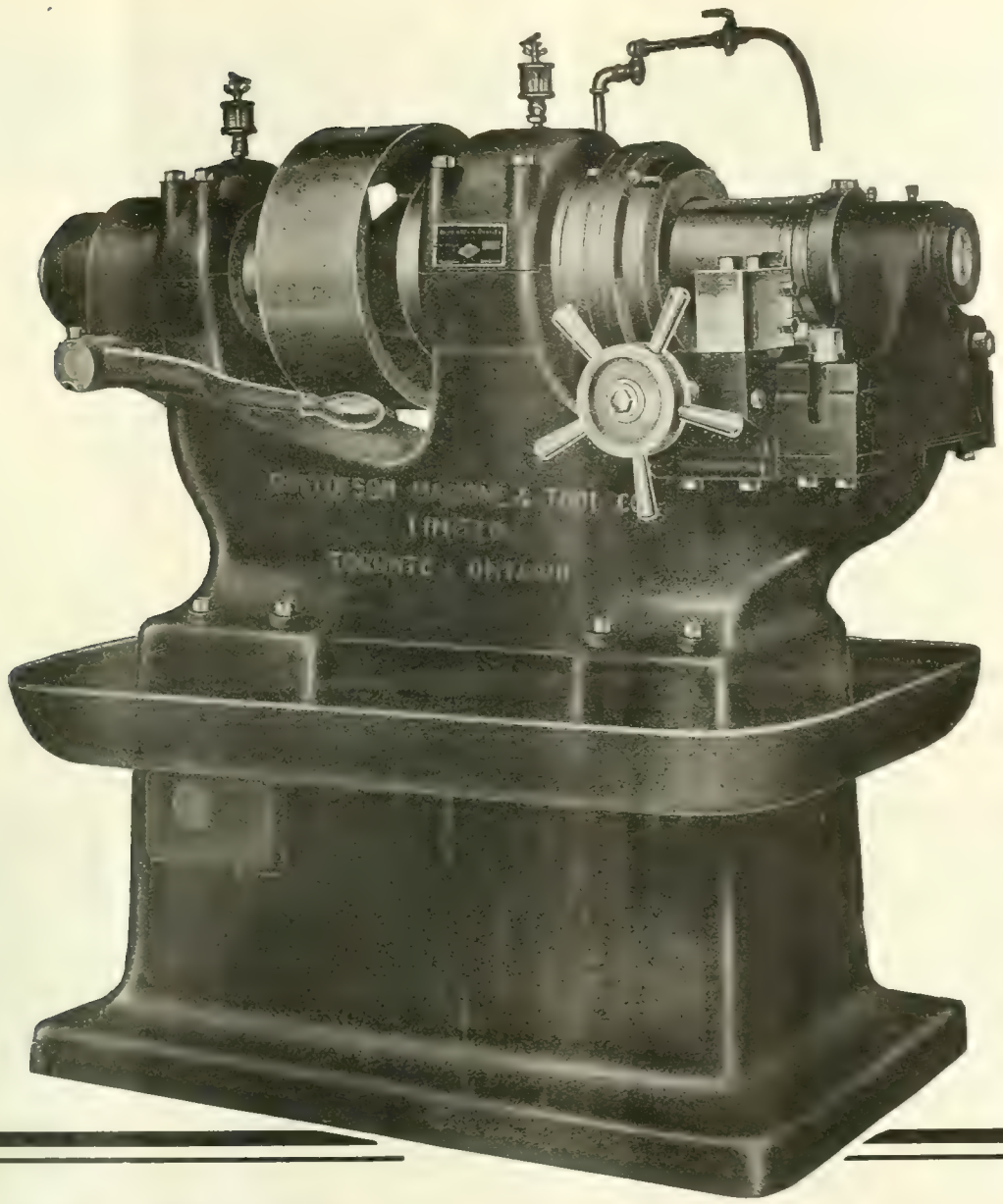

Just Now—

we have two 4.5 machines ready for immediate delivery

THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are also built for 15, 18, 60-pdr. and 6" shells.

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"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in **"Red Cut Superior"**, a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs and Treated Tool Holder Bits.

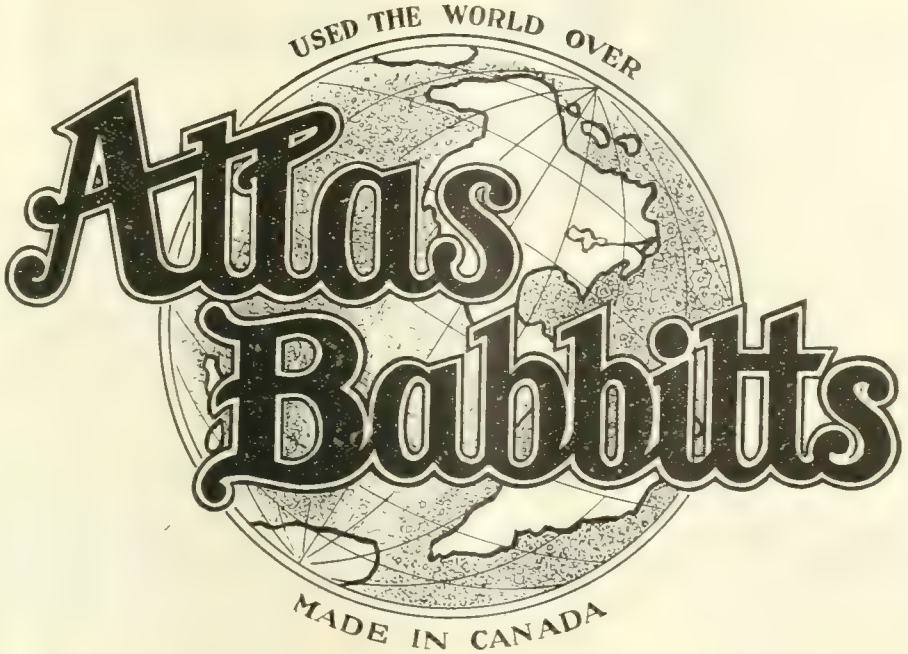
Send for folder.

Are your tools made of **Red Cut** ?

VANADIUM-ALLOYS STEEL CO.

Pittsburgh, Penna. Works at Latrobe, Pa.

ECONOMY **UNIFORMITY**



AMACOL
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ATLAS
MASCOT
W.E.W. BABBITT

THIS RANGE OF
ATLAS BABBITTS
WILL MEET ANY OF
YOUR DEMANDS
AND **SATISFY** YOU

ATLAS METAL and ALLOYS COMPANY of CANADA, Limited
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Sales Agents:

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IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

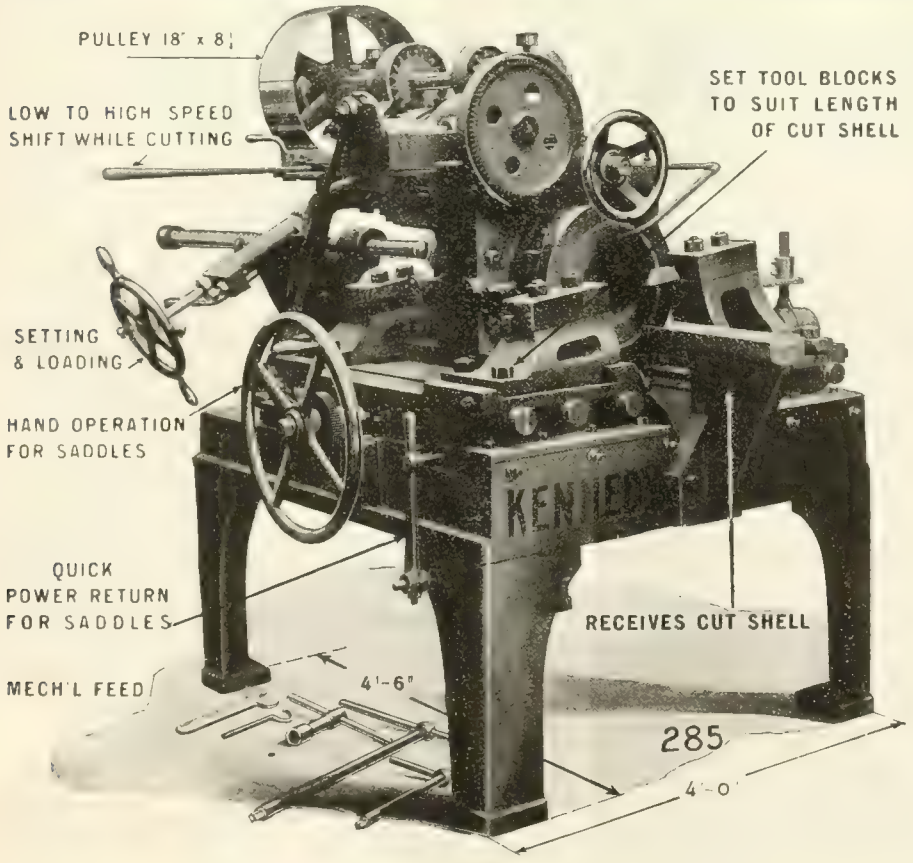
Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. ***Write for prices.***

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The
Wm. Kennedy & Sons,
Limited
Owen Sound

THE WALCOTT LATHE

THERE are 36 years of *successful* lathe building to back up any claim we make as to superiority. This length of time has enabled us to study very thoroughly the requirements of a lathe and its present day uses. The outcome of this study is in our product. Our clients will verify our claims as to superiority.

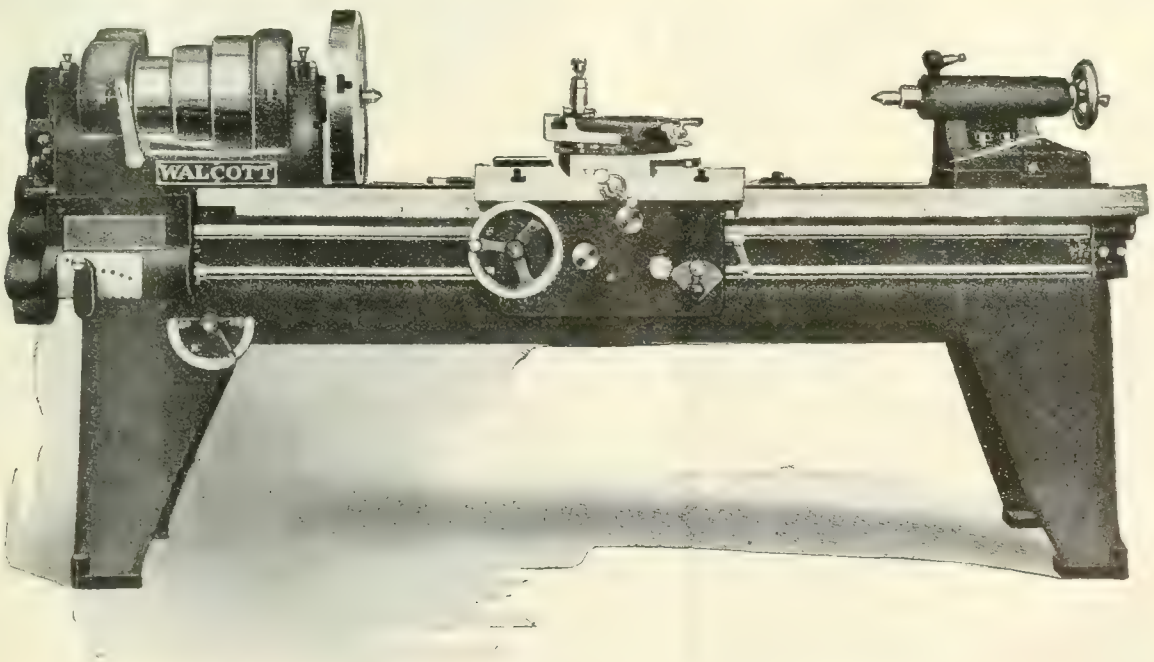
There are two factors that occupy our study very thoroughly—Efficiency and Safety. Not only safety for the operator but for the machine also. This lathe features drop-forged gears in apron, 32 changes, 2 to 112 threads per inch, quick-change-gear. Lines include lathes from 14″ to 28″. An inquiry will get immediate particulars.

Established in 1881

Walcott Lathe Company

414-420 Jackson St. Jackson, Mich., U.S.A.

H. W. PETRIE, TORONTO, ONT., *Agents*



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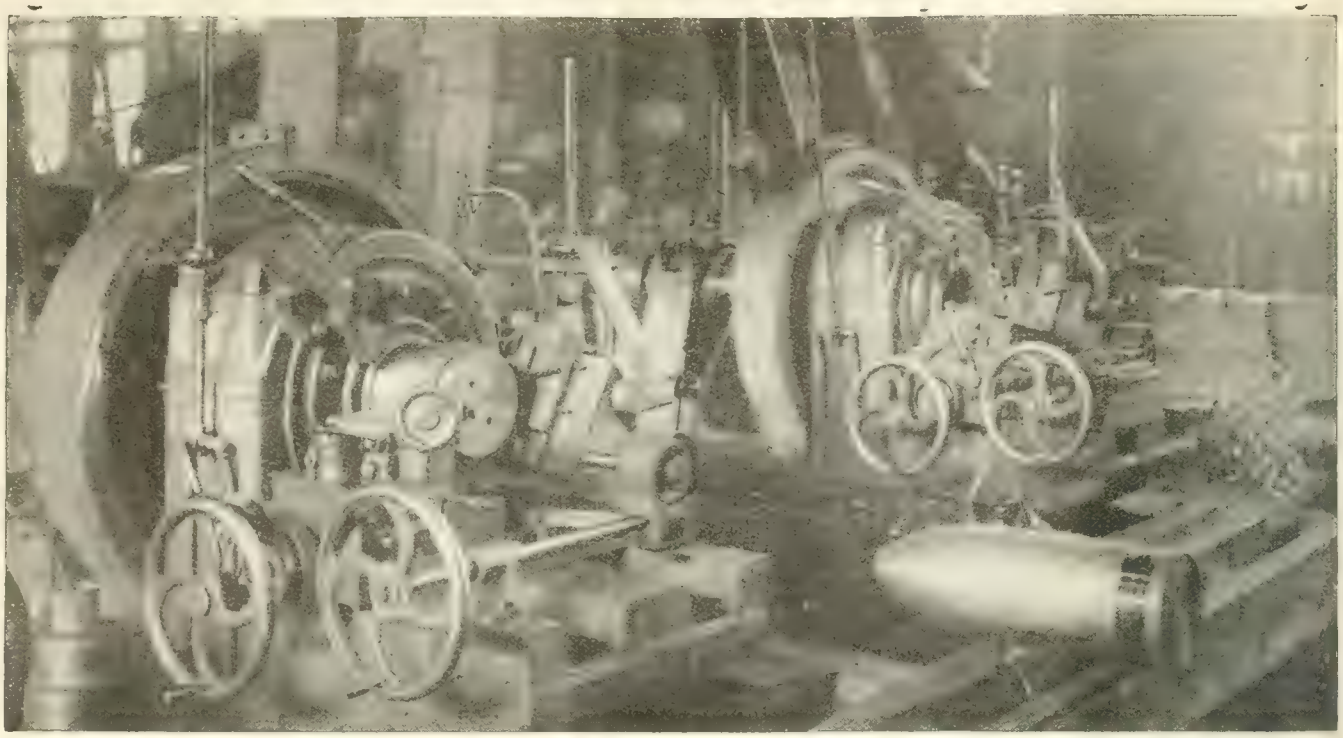

Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" snells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.

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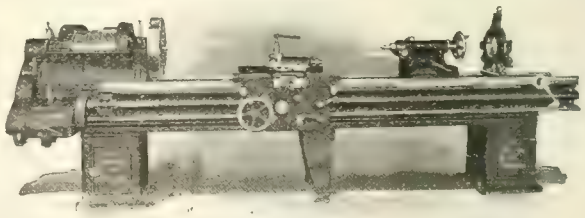
SIDNEY

You'll do mighty well not to forget that name

"SIDNEY"

when you are in the market for



LATHES

Represented in Canada by:

FOSS & HILL MACHINERY COMPANY Montreal, Que.
H. W. PETRIE, LTD. Toronto, Ont.

Write to the above or to the munufacturers:

THE SIDNEY TOOL COMPANY
Sidney, Ohio, U.S.A.

for a copy of the Lathe Bulletin No. 30.

FOR SERVICE!

QUALITY

not Quantity is the Watchword at the Factory of

THE LATHE WITH THE PULL

Every Foreman, every Workman is instructed to this end. Every facility is furnished and applied for accuracy.

CUSTOMERS ARE SATISFIED

or repeat orders would not be sent so often by buyers all over the world who are contented and pleased

WITH CISCO LATHES

MAKE THEM BETTER, THEY ARE GOOD, MAKE THEM BETTER
is humming in the ears of every employee

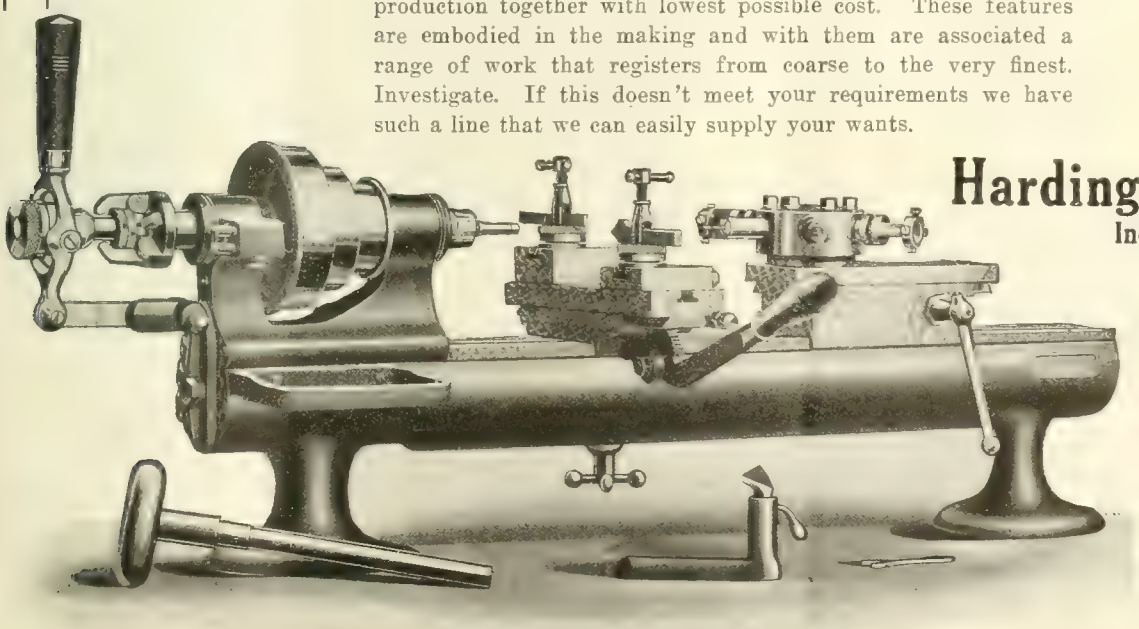
WHY DON'T YOU ASK

The A. R. Williams Machinery Co., Ltd.
SELLERS IN CANADA
OF CISCO LATHES

The Cincinnati Iron and Steel Co.
CINCINNATI, U. S. A.
MAKERS OF 14″, 16″, 18″, 24″ LATHES

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros
Inc.

1770 Berteau Avenue,
CHICAGO,
ILL., U.S.A.

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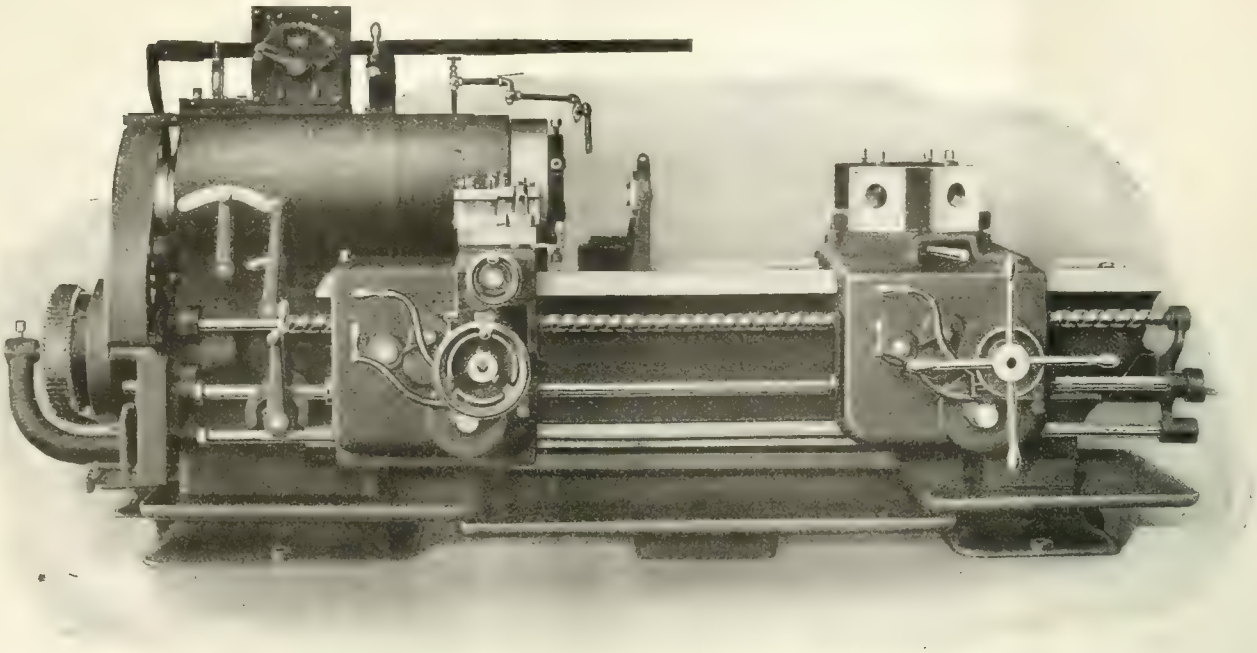
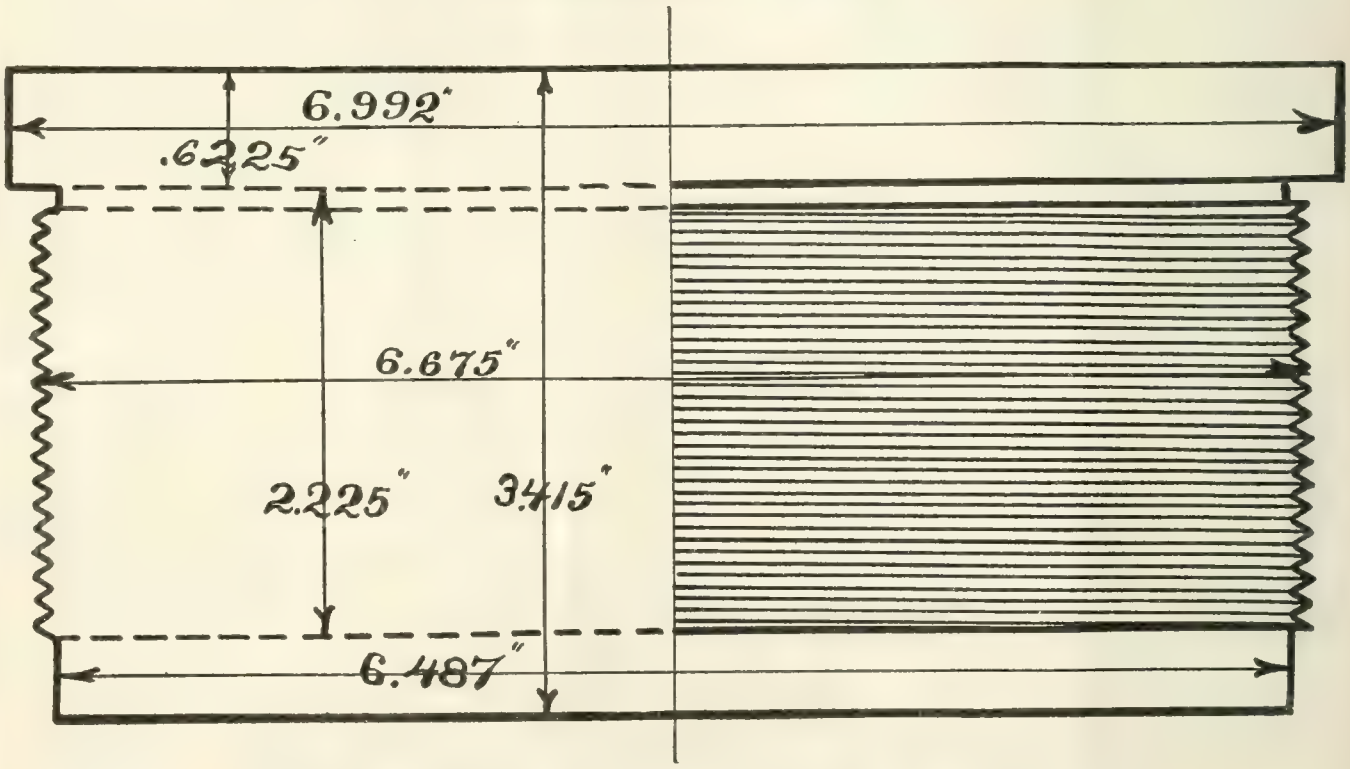


A General Purpose Turret Lathe used on Ammunition Work



Base Plug for 9.2-Inch Shell

FINISHED COMPLETE ON ABOVE LATHE IN 20 MINUTES

Write for Information

STEINLE TURRET MACHINE COMPANY

MADISON, WISCONSIN, U.S.A.

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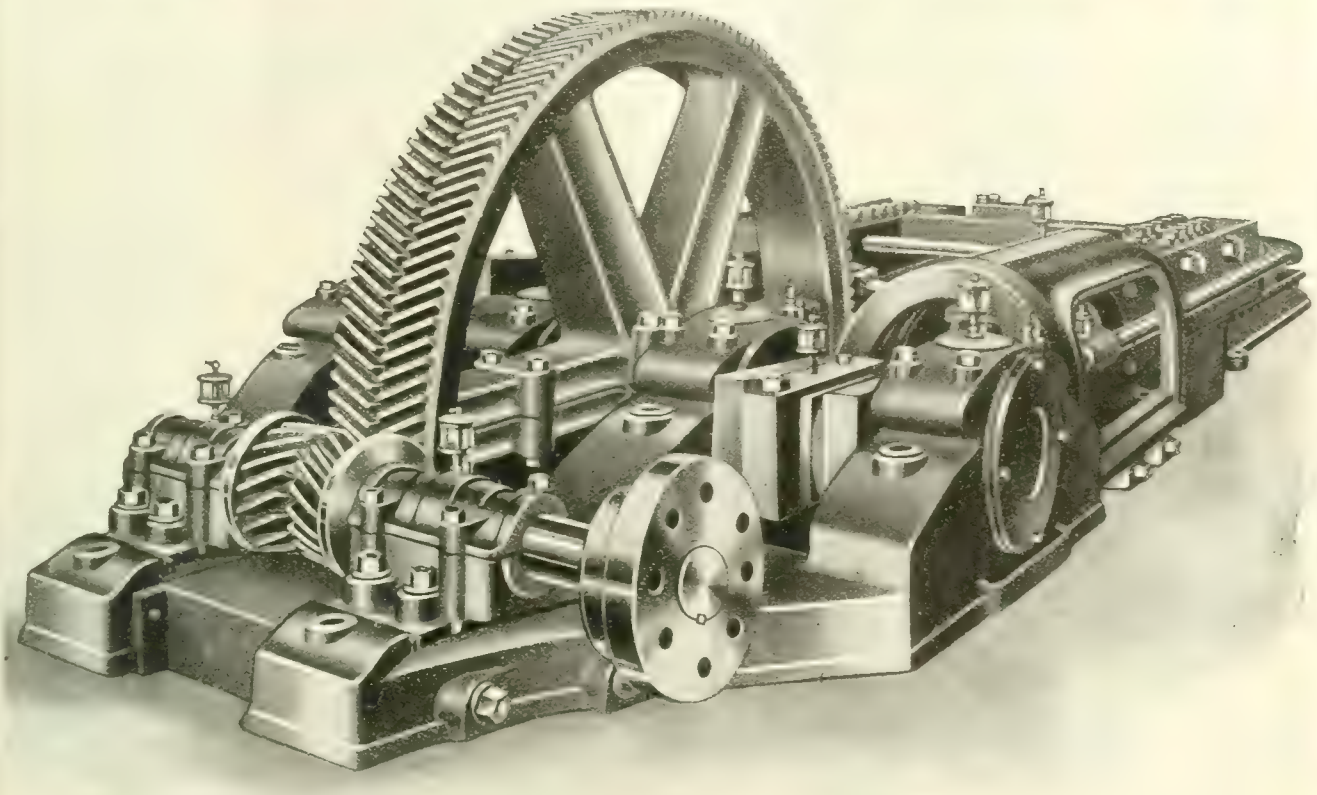
Hydraulic Pumps



We are builders of High Pressure Pumps to be used in connection with accumulators and presses for making forgings of all kinds.

Immediate shipment to Canada or any part of the world of pumps and motors.

Blake Pump & Condenser Co.

FITCHBURG, MASS. 30 Church Street, NEW. YORK

Cable Address: "Blakepump"

Montreal Machinery & Supplies, Ltd., 260 St. James Street, Montreal, Canada

Representatives for the Province of Quebec.

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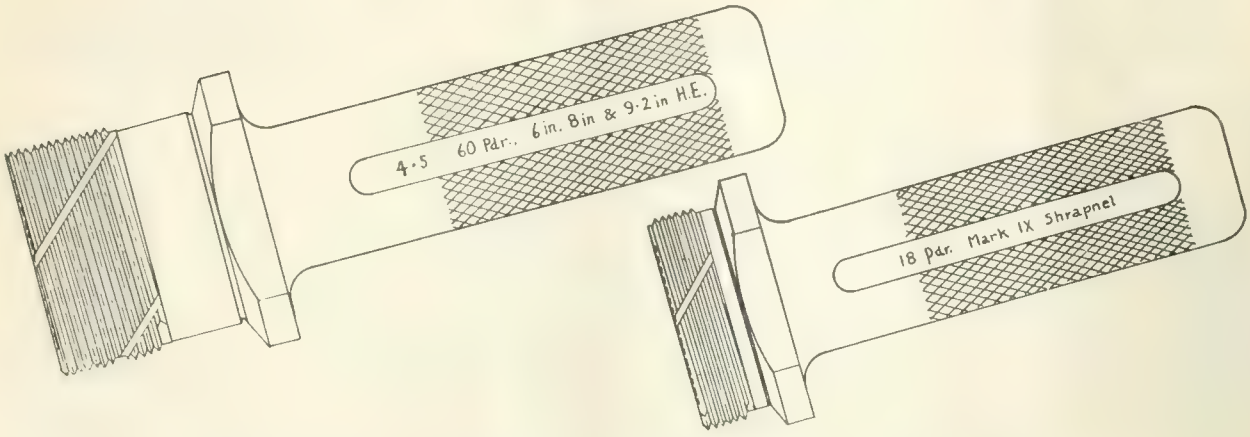
FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

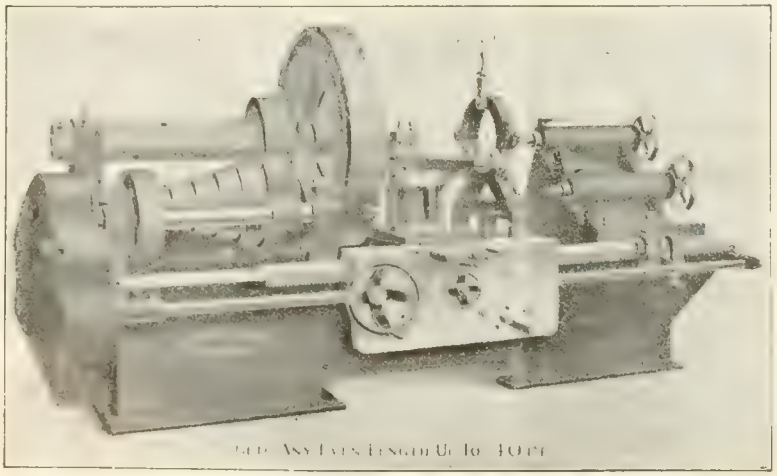
Windsor, Ontario

Do More!

--put on more steam

is the industrial slogan of to-day

You can "do more" with McCabe's "2-in-1" lathe than any other big Lathe built, because you have "more" capacity.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe.

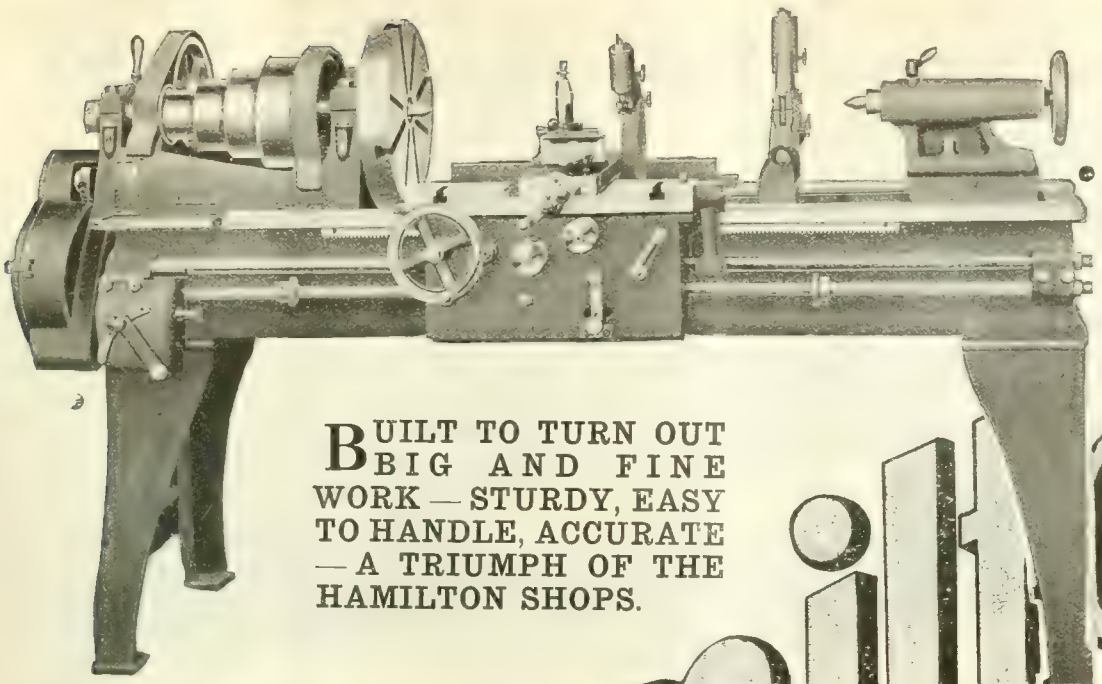
It will carry DOUBLE the burden, by handling such work as you would put in a 26-inch lathe when there's no big work to do, as a 48-inch.

Our most valuable resource is time—save the time other big lathes stand still by installing McCabe's "2-in-1" Double Spindle Lathe. Never idle. Save $1,000 in the price. Other big lathes cost that much more.

Immediate Shipment 12-ft. beds—from stock.

J. J. McCABE

149 Broadway,
NEW YORK



BUILT TO TURN OUT BIG AND FINE WORK — STURDY, EASY TO HANDLE, ACCURATE — A TRIUMPH OF THE HAMILTON SHOPS.

Hamilton

"The Distinguished Service Lathe"

In this Lathe you see exemplified the skill of expert workmen with years of "Hamilton" experience—experience which means something. It is a lathe that well represents the best of our high class machines — a lathe most carefully constructed with lasting materials—a lathe that turns out work of the calibre of its own ideal construction.

The illustration shows the sturdy, easy working "Hamilton" complete with equipment — single back gears, hollow steel spindle, self-oiling bronze boxes, power cross feed, chasing dial, quick change feed box, automatic stop for feed. There is a good deal more we can tell you about this profit-making quality worker. Write to us and we will send you interesting literature.

Rapid Production HAMILTON Machine Tools

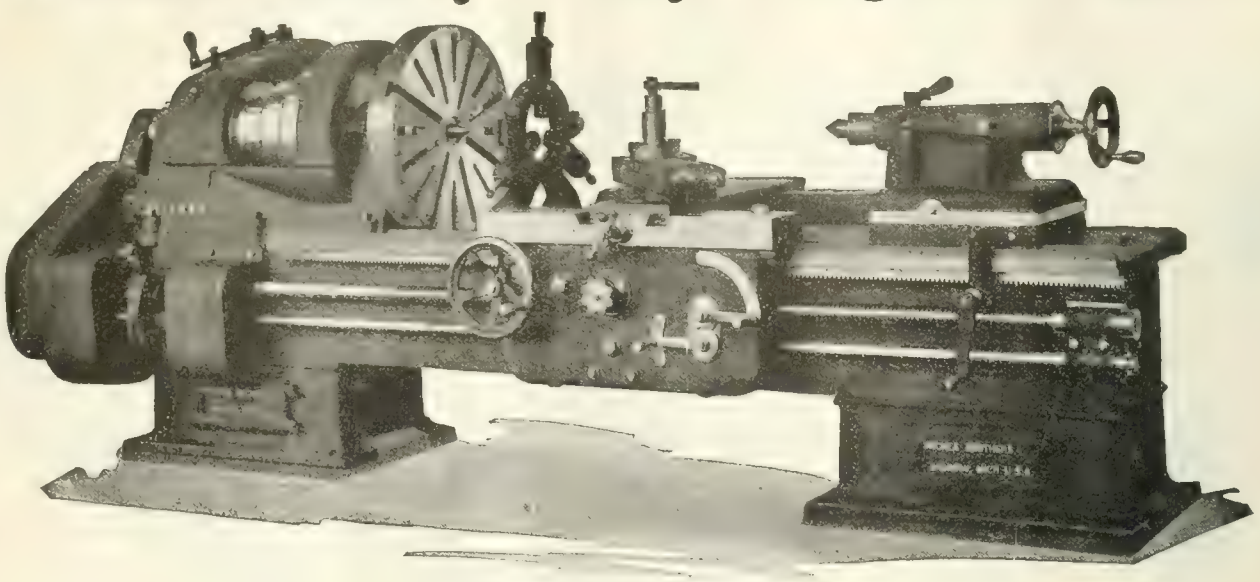
FOR 25 YEARS MAKERS OF FINE MACHINE TOOLS

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Wickes Heavy Duty Engine Lathe

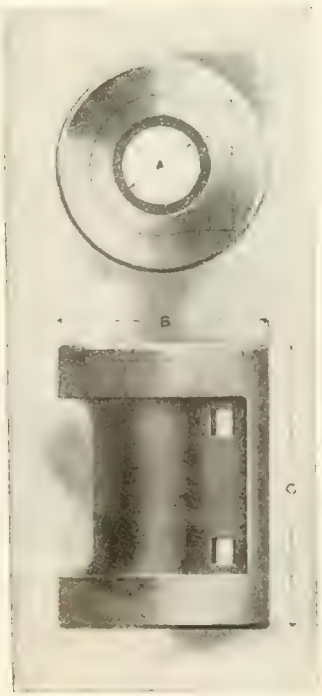


The Wickes 26" Heavy Duty Lathe.

Built in lengths from 8 ft. up. Has 3-step cone, is double back-geared and has double plate apron.
This tool is built for the most severe service; all parts liberal in size; has special ball thrust bearings; steel apron gears; coarse pitch and wide face gears, which are all well guarded.
Let us tell you about this lathe and our 20", 32", also our 17" Rapid Production Lathe for Automobile and other work.
We can make prompt shipment.

WICKES BROTHERS **Saginaw, Michigan**

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

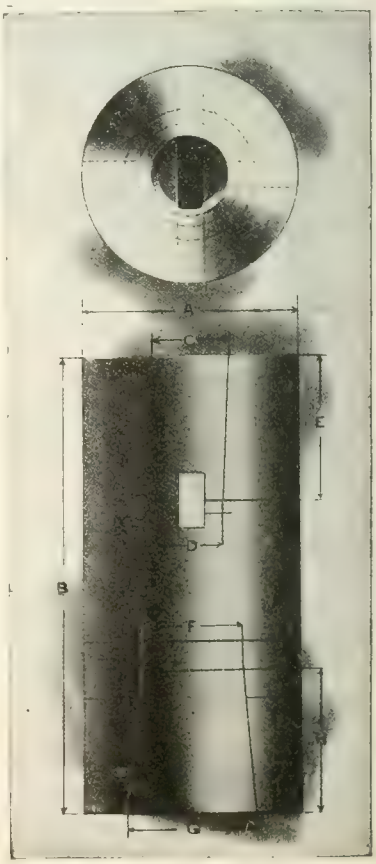
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter.
No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.



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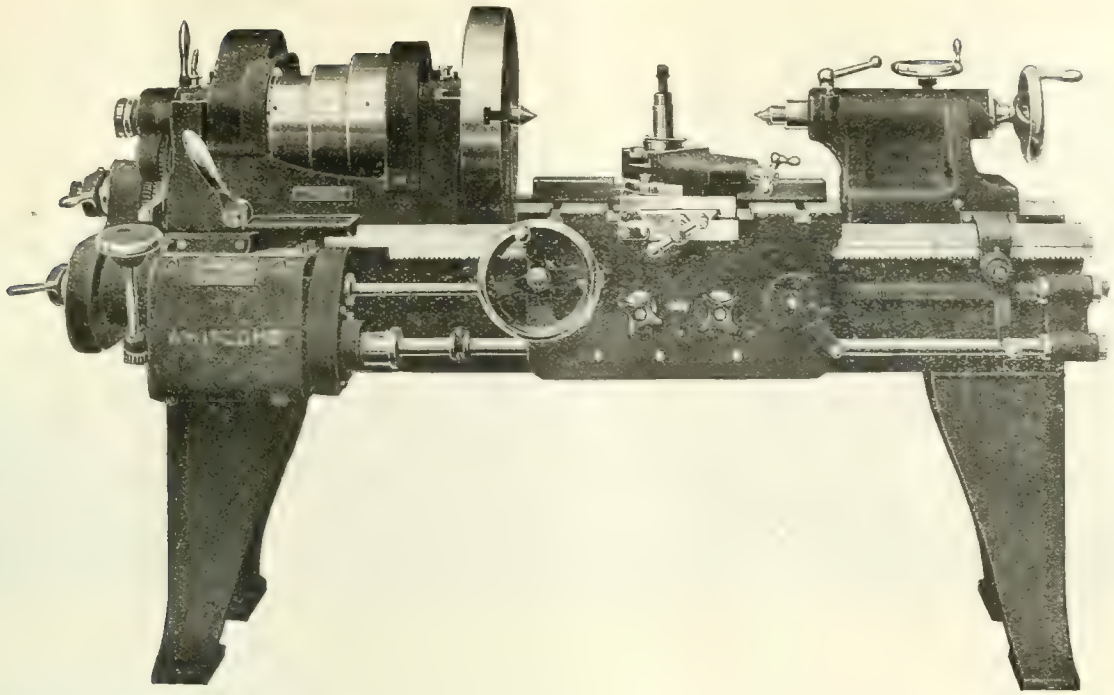

THE THREE ESSENTALS OF A GOOD LATHE ARE—
GOOD DESIGN
GOOD MATERIAL
GOOD WORKMANSHIP

How the Whitcomb-Blaisdell Lathe Fulfills the Requirements—

In Design—

Summing up, the Whitcomb-Blaisdell Lathe is a well-balanced tool, heavy and powerful, but light running and not clumsy, consequently adapted for a wide range of work.

In Material—

Here are proofs of the excellent quality of material used in Whitcomb-Blaisdell Lathes—head spindle 65 to 70 point carbon steel; spindle bearings a service-giving bronze that resists wear; beds of semi-steel casting. A similar quality of material is maintained throughout.

In Workmanship—

After all, workmanship rests chiefly upon the workman. The men in our shops are capable, experienced and satisfied workers fully understanding and contributing their share to our aim to produce highest grade tools.

Let us send you our Catalog fully descriptive of the many good features of WHITCOMB-BLAISDELL Lathes.

The Whitcomb-Blaisdell Machine Tool Company

Lathes WORCESTER, MASS. Planers

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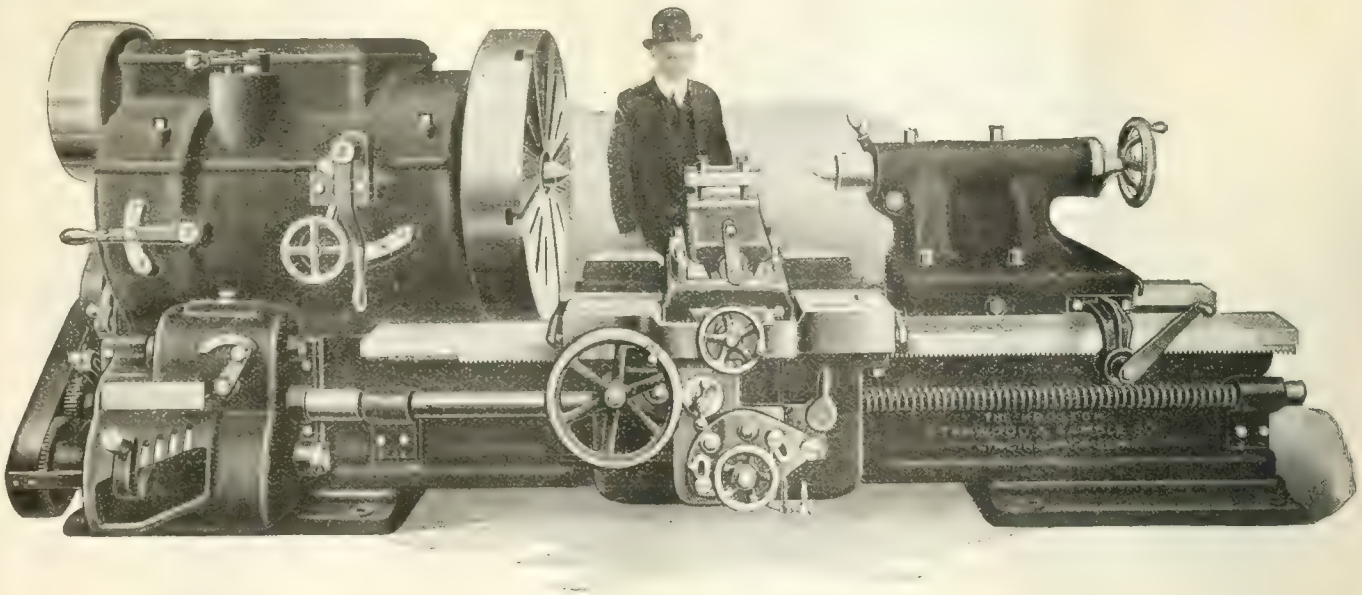


H-S-G TRADE MARK. LARGE SWING LATHES BUILT IN 30, 36, 42, 48, 54 AND 60 INCH SIZES

ILLUSTRATION SHOWS 36 INCH SELECTIVE SPEED HEADSTOCK LATHE

Write for bulletins 705, 706 and 707

THE HOUSTON, STANWOOD & GAMBLE COMPANY

CINCINNATI, U.S.A.

Sold by

RUDEL-BELNAP MACHINERY CO.

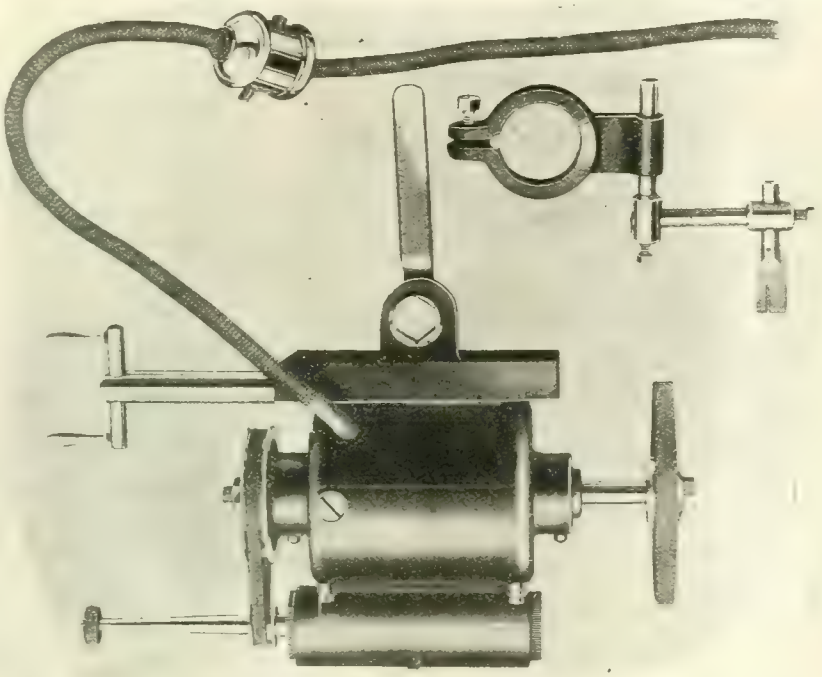
TORONTO and MONTREAL

ARO

Built to bring down High Cost of Grinding

30 Thousand Revolutions per minute

Speediest Portable Electric Grinder on Market



The ARO is absolutely accurate, too. It's strong and durable, a perfectly constructed piece of mechanism, that will surely reduce your grinding costs. Think of it—30,000 R.P.M.

Built on superior lines—Armature, internal spindle, pulleys and large emery wheels are dynamically balanced, preventing vibration. There's no end thrust or side play. Motor and internal spindle are equipped with S. K. F. and "Norma" Bearings.

R. E. T. Pringle, Limited

Manufacturers' Agents

OFFICES:

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809 Unity Bldg. - - - - - Montreal, Que.
3402 Osler Ave. - - - - Vancouver, B.C.
302 Donalda Block - - - - Winnipeg, Man.

P H

TRADE MARK

Quality Files

Finest Crucible Cast Steel +
Expert Workmanship =
File Perfection

File perfection means P.H. Files which cut faster and wear longer than any other brand.

Let us demonstrate this to you.

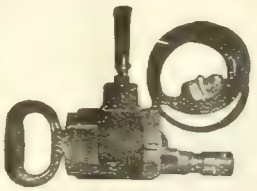
Port Hope File Mfg. Co., Ltd.

Port Hope, Ont.

Ask Your Jobber

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

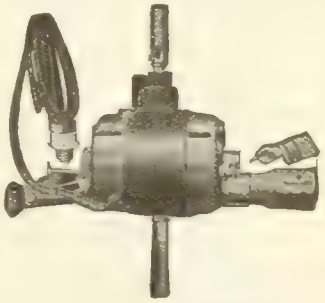
3 SIZES

3-16 inch, W.G.T.	6 lbs.
¼ inch, W.G.T.	9 lbs.
⅜ inch, W.G.T.	12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



½ inch—2 SPEED.
Speed, 400-750 R.P.M.

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THE UNITED STATES ELECTRICAL TOOL CO.

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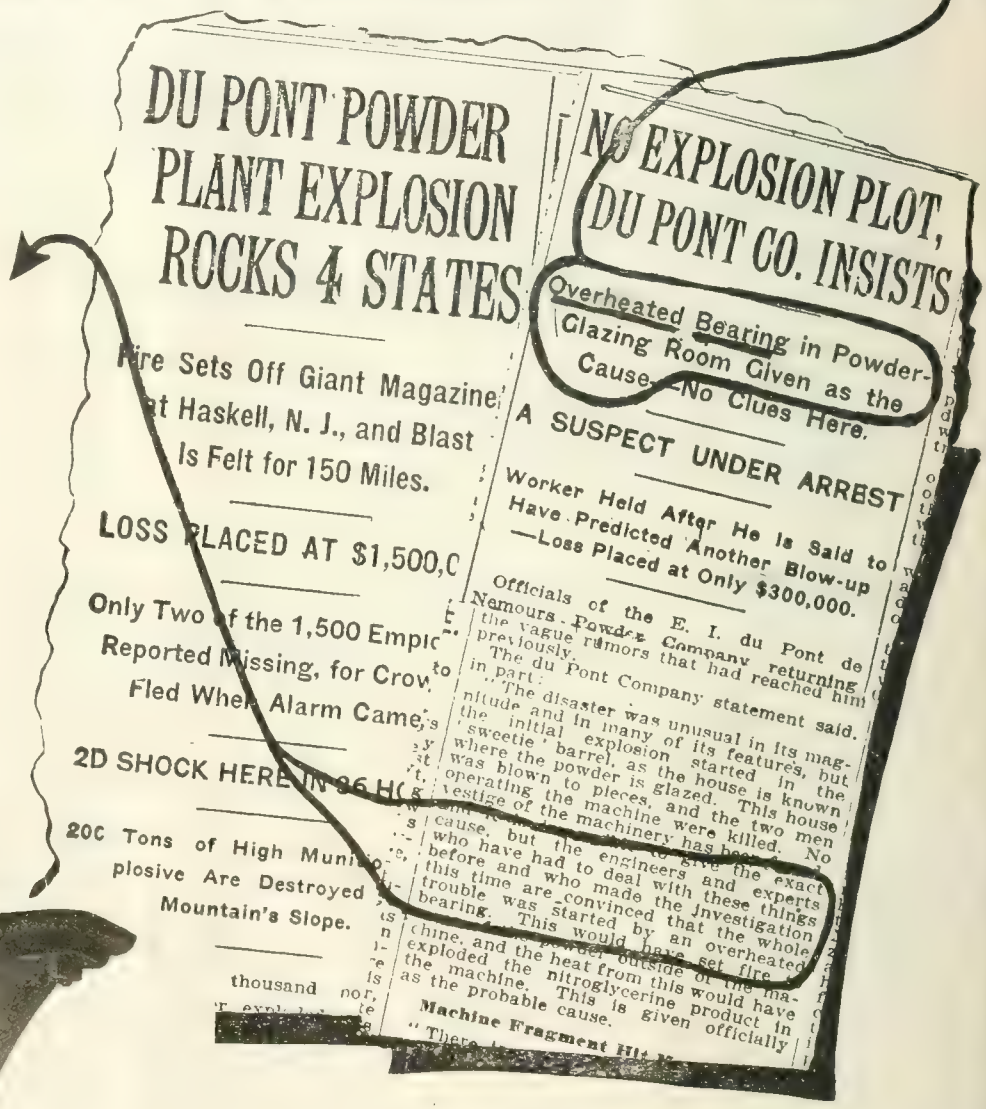
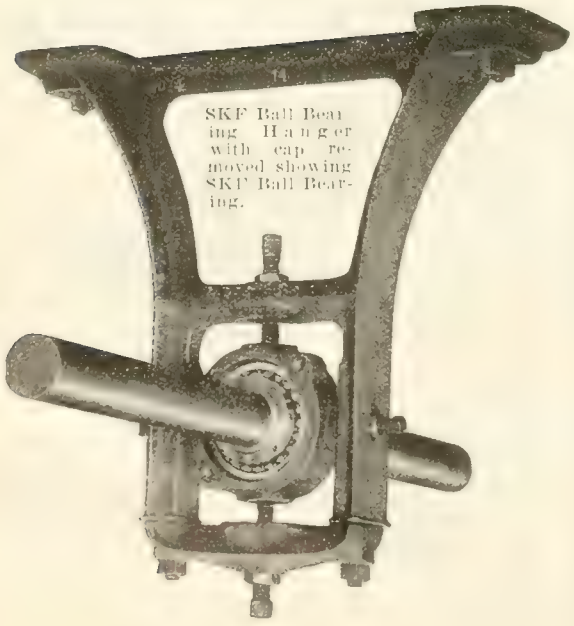
SKF BALL BEARINGS

Would Have Prevented This

The Du Pont Company, said:—

"The engineers and experts who have had to deal with these things before and who made the investigation are convinced that the whole trouble was started by an overheated bearing."





What are you going to do about it? Are you going to **keep on** using plain bearings until the disaster hits you—until you wake up some morning and find your plant "gone up in smoke"—or are you going to apply the REMEDY?

SKF Self-Aligning Ball Bearings eliminate hot bearings, reduce fire hazards, save power, lubrication, maintenance, equipment and insure freedom from shut-downs for bearing renewals.

SKF Bulletins explain. Write for them.

CANADIAN SKF COMPANY LIMITED

47 King Street West Toronto, Ont.

Sole Canadian Agents for SKF Transmission Bearings

THE CANADIAN FAIRBANKS-MORSE CO., Limited

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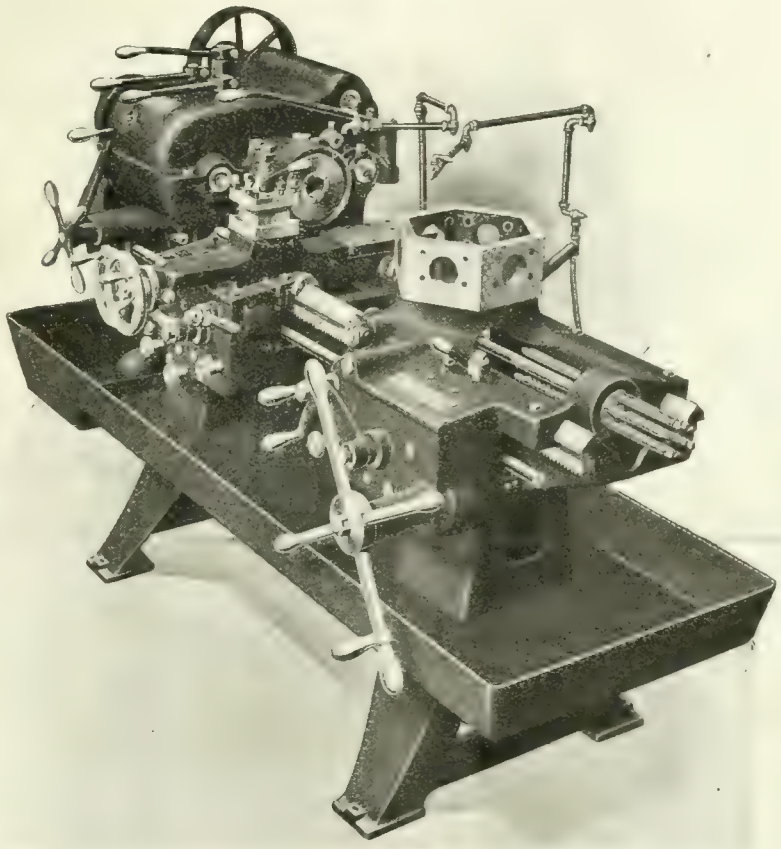
FOSTER



FOSTER

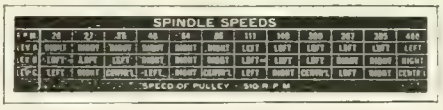
No. 1-B Universal Turret Lathe

POWER

One of the secrets behind rapid production is the power behind the cutting tool.

It is the claim of the designer that this Machine has the most powerful head of any machine of its class and size. A few figures substantiating this claim would undoubtedly be of interest.

The 3 in. belt running at a speed of 1600 feet per minute is capable of delivering 5.1 horsepower to the pulley. This is figured at the value of 35 lbs. per inch of width of the belt which is a very conservative figure as a belt in good condition is capable of delivering upwards to 75 pounds per inch of width. The gears and friction clutch are designed for a load greatly in excess of this.

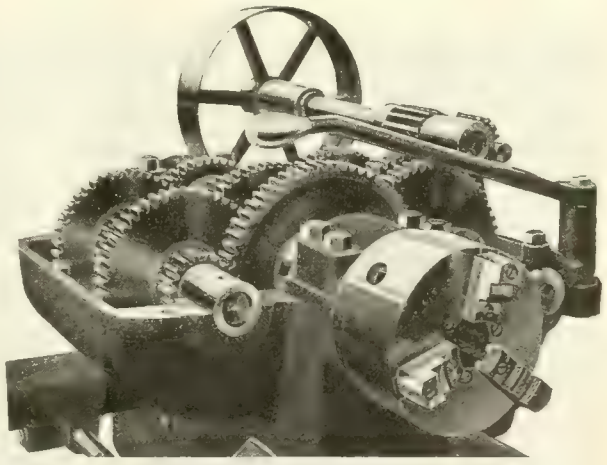


SPEED RANGE

Please note that this covers the requirements for hard cast iron of the largest capacity of the machine up to and including the proper speed for drilling soft steel.

LUBRICATION

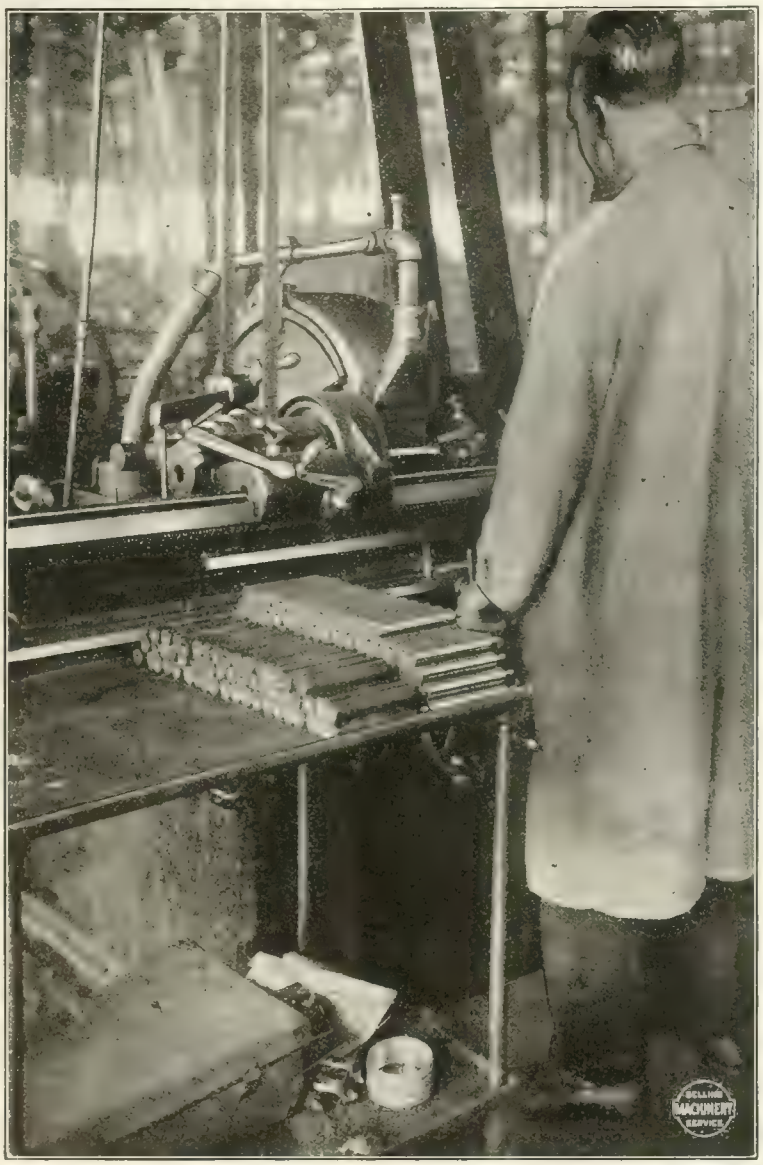
The gears and bearings throughout the head are automatically lubricated. This means minimum of friction and wear and maximum of life.



Note, however, that this is only one of the several machines built by

FOSTER MACHINE COMPANY

ELKHART, INDIANA, U.S.A.



Another Good Example *of* NORTON "Wide Wheel" Grinding on Automobile Parts

Fast time on automobile parts grinding is being made by the Morrow Mfg. Co., (Elmira, N.Y.) where wheels 6" wide are used and the entire cut taken by feeding the wheel directly into the work. The two pieces shown below are typical of this work.

NORTON GRINDING COMPANY
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Selling Agents for Canada:
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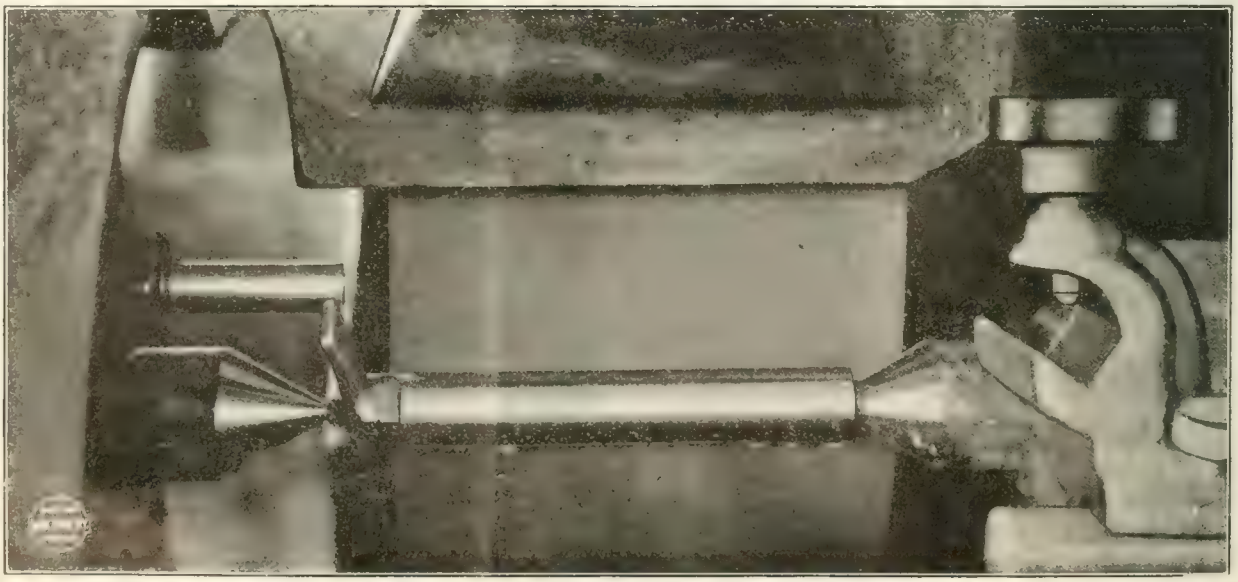


520 N

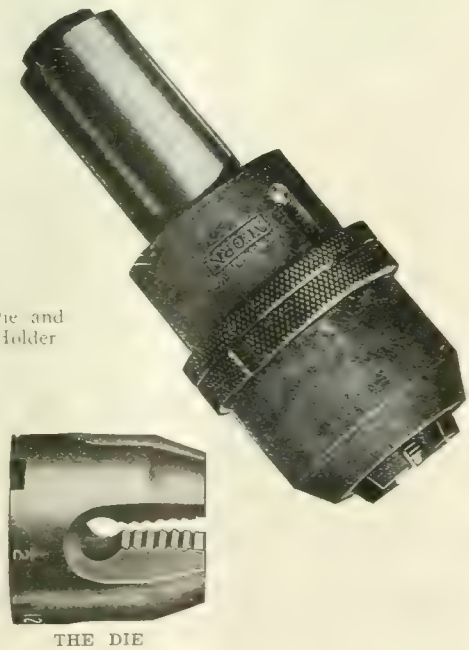
Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

NORTON COMPANY
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS:
NIAGARA FALLS, N.Y., CHIPPAWA, ONT.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria: F. H. Andrews & Son, Quebec, Que. 8023



Die and Holder

THE DIE

Let the ACORN DIE Cut Your Threads

The adjustment is mechanically perfect—simply turn the cap and all the prongs of the die converge equally—a great advantage over the spring die.

The Acorn Die Holder is smaller in diameter than any other die holder of equal cutting size.

The float permits the die to follow its own lead.

The die projects slightly beyond the adjusting cap, making it admirably adapted for shoulder work—and the chips are thrown ahead of the work, so the die does not clog.

Will you try the Acorn Die on your own work—under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited

GALT - ONTARIO

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

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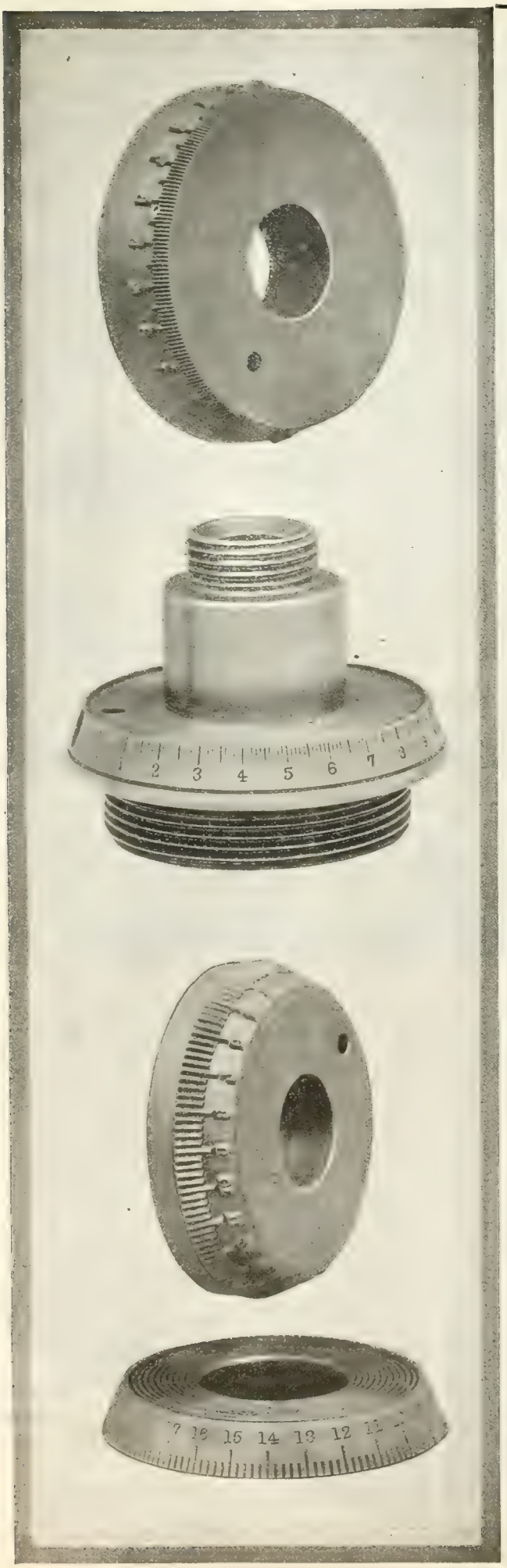

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A PRODUCT WORTH MARKING IS WORTH MARKING RIGHT
MARKING DEVICES

Steel Roller DIES

For Marking No. 80 Fuse

To economically stamp fuse parts with the clean-cut uniform markings they require, calls for dies that are accurately made and able to stand up. Matthews Steel Dies and Stamps insure the fuse manufacturer just what he wants—the maximum number of markings and clear, true reproductions, according to specifications.

They are made of a special grade of tool steel, hand engraved and heat treated for maximum accurate service. Furnished in three styles, i.e.:

1. For marking graduations only.
2. For marking numbers only.
3. For marking numbers and graduations in one operation, as illustrated.

If your present marking equipment is unsatisfactory for any reason, fill out and return the coupon below.

Sixty-seven years' experience making high-grade marking devices of every type.

Ask for Matthews' Catalog of Steel Lettering Stamps and Dies.

Jas. H. Matthews & Company

67 Years in Business

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Distributors for Canada:

Canadian Fairbanks-Morse Co., Ltd.
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

We are making.....Type of Fuse.
Send full particulars as per your advertisement in Canadian Machinery.

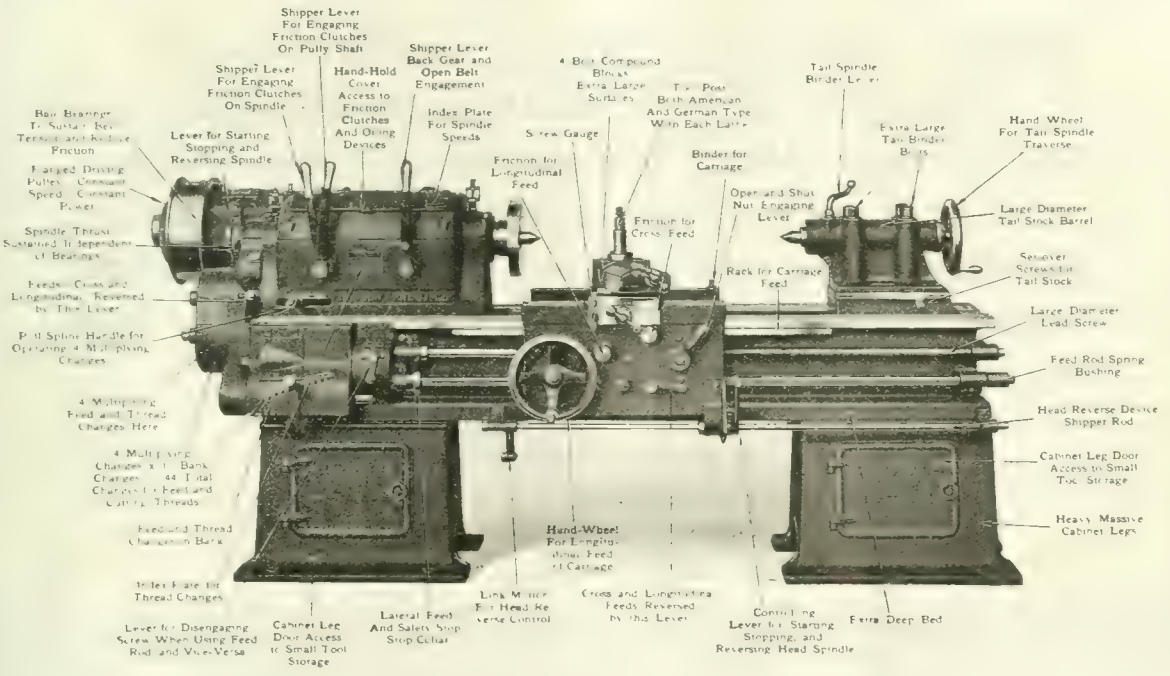
Name.....

Address.....

REED-PRENTICE COMPANY

R-P

WORCESTER MASS. U.S.A.



IMAGINE

THAT YOU ARE STANDING IN FRONT OF THE LATHE HERE PICTURED.

COULD YOU WISH FOR A MORE CONVENIENT LOCATION OF THE SPEED, FEED, LEAD-SCREW AND CONTROL LEVERS, OR A MORE PERFECT ARRANGEMENT?

THE SPEED CHANGE LEVERS OPERATE INDIVIDUAL METAL-TO-METAL EXPANDING FRICTION CLUTCHES. SPEEDS ARE CHANGED AT ANY TIME IN ANY WAY—EVEN THOUGH THE TOOL IS CUTTING. THE CHANGE IS SILENT AND INSTANTANEOUS.

FEED-ROD AND LEAD-SCREW CANNOT RUN AT THE SAME TIME CARELESSNESS IN MANIPULATION CANNOT CAUSE DAMAGE TO THIS LATHE.

ASK ANYONE WHO HAS EVER OPERATED A REED-PRENTICE—"WHAT DO YOU THINK OF A REED-PRENTICE?"

THE ANSWER TO THAT QUESTION HAS PROVED THAT THEY ARE UNUSUALLY SATISFACTORY TO BOTH OPERATOR AND OWNER.

REPRESENTED BY

CANADIAN FAIRBANKS-MORSE CO., LTD.

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THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Machine Tools For Immediate Delivery

TENS of thousands of dollars worth of Machine Tools are in stock at our Montreal and Toronto Warehouses for the convenience of the Munition Manufacturers of Canada. Munition contracts do not permit of any time being wasted waiting for a machine tool equipment to perform the work.

PLACE YOUR ORDER WITH OUR NEAREST BRANCH HOUSE, AND SECURE PROMPT DELIVERY.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House for Mechanical Goods"

ST. JOHN QUEBEC MONTREAL OTTAWA TORONTO HAMILTON WINDSOR
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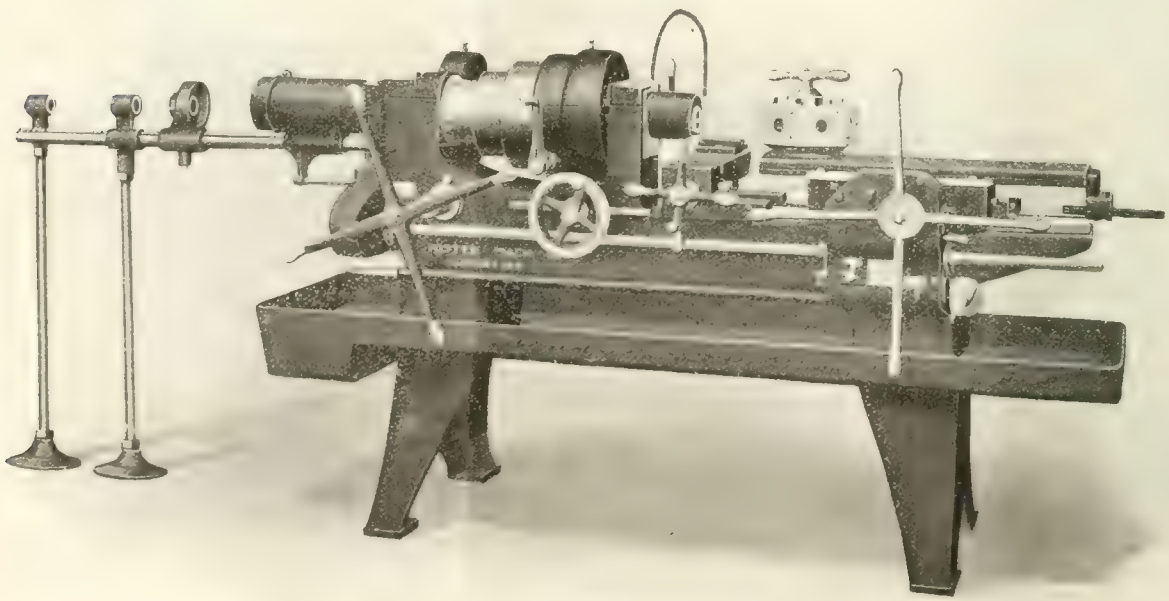
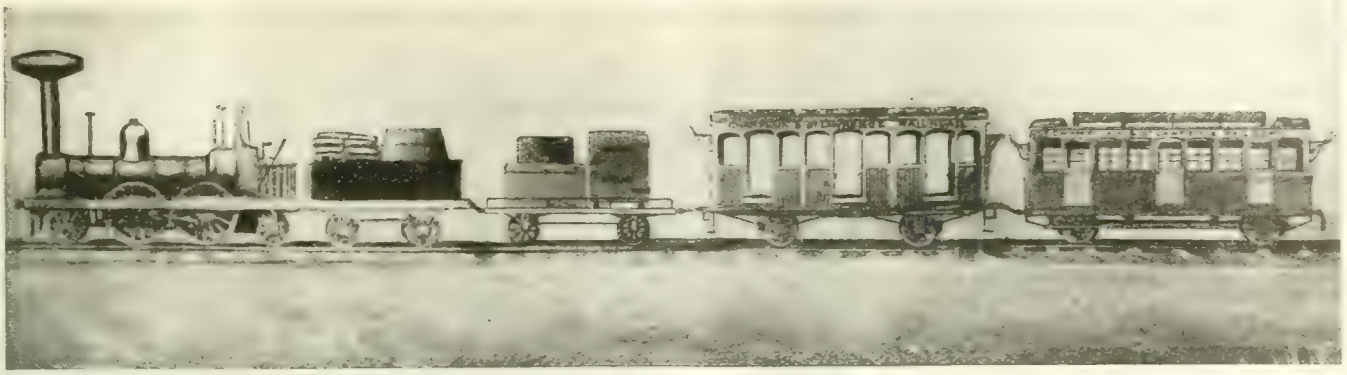


Mention this paper when writing advertisers. It will identify the proposition about which you require information.



FIRST RAILROAD TRAIN IN CANADA. LAPRAIRIE, QUE.-ST. JOHNS, QUE., YEAR 1836.

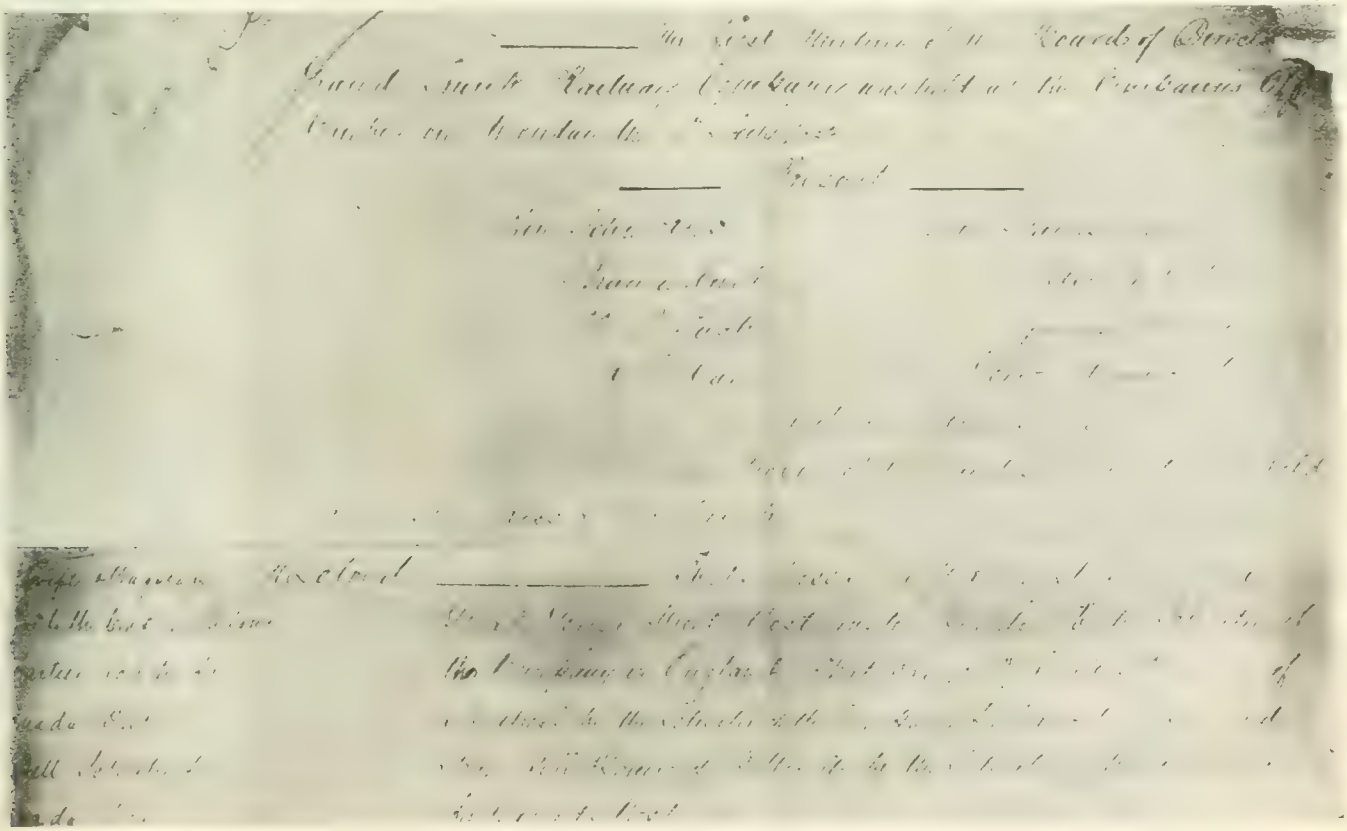
Some Facts and Figures Relating to Canadian Railroads*

By C.T.R.

Railroading has filled a large place in Canadian life and progress from a date around some three decades preceding, and all the way through the Confederation period. Nor is this to be wondered at where account is taken of our gigantic territorial area, our agricultural and mineral wealth, and the opportunities arising therefrom to establish and develop manufacturing and general industrial enterprises. The part played by our railroads has been to bring to and place the man in touch with Canada's variety opportunity.

VICISSITUDE has been as marked in Canada's railroad enterprise as it has been in the spheres of her agricultural, commercial, and industrial endeavor. Despite the progress and development that have taken place since 1836, in which year the first steam railroad train operated on Canadian soil between Laprairie and St. Johns, P.Q., it cannot be truly said taking in toto, the situation as we find it to-day, that the foundation on which our railroad fabric rests is as substantial as is desired, or as had been anticipated. The railroad situation in Canada at the present time furnishes a variety of essentials to constitute it into a burning question, politically and industrially; regarding the merits or demerits of this

*Compiled for the "Mail and Empire" special Confederation Number, and reproduced here.



REPRODUCTION OF THE MINUTES OF THE FIRST MEETING OF THE GRAND TRUNK RAILWAY CO.

particular phase of the subject, it is not, however, the purpose of this article to discuss.

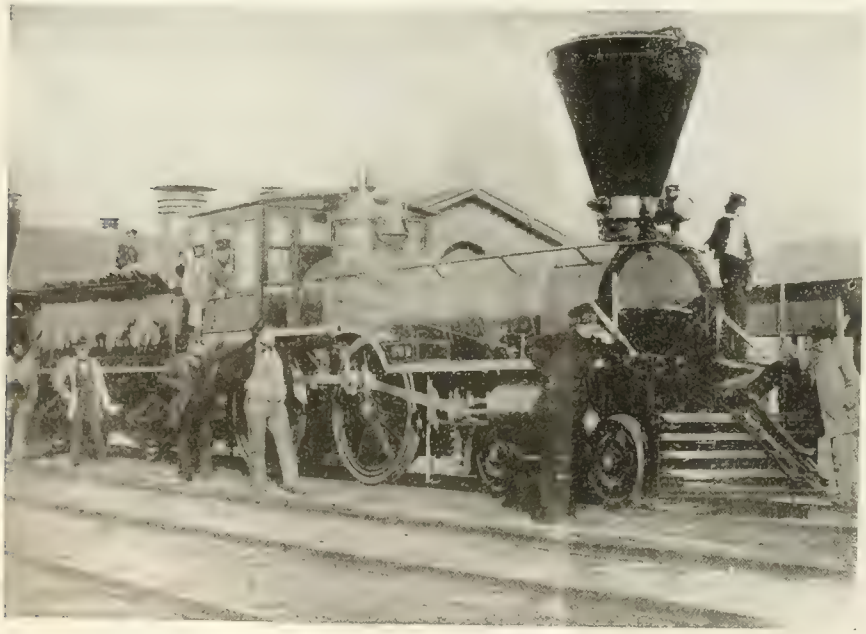
Our Railroad Systems

The group of steam railroads established and now operating within the Dominion may be said to consist of the Grand Trunk Railway System, the Canadian Pacific Railway, the Canadian Northern Railway, and the Canadin Government Rilways, the latter embracing the Intercolonial Railway between Montreal and the Maritime Provinces, and the Grand Trunk Pacific connecting with same at Levis, P.Q., by car ferry to Quebec City, and from there across the continent to Prince Rupert, B.C. Having regard to the territorial extent of our country, there does not appear to exist a superabundance of company organizations, even including the Government-controlled unit; on closer investigation, however, it will be found that we are overstocked as regards transcontinental railroads and shy in the branch line feature.

Railroads are in the nature of life-givers to every country, be the latter young or old as is our habit of classification. In the opening up and development of a new land they are at this stage of the world s history of the greatest importance, and no better exemplification of the truth of this assertion is available than is evidenced by this Canada of ours. Without our railroads, not a tithe of the existing agricultural activity, nor of our mineral resources development would have been possible, and without the agricultural and mineral progress that has taken place, our commercial and manufacturing achievement would have been a sheer impossibility. The most important business in the world is farming, and in this war time—more particularly since Germany's submarine activities became so virulent, we have been made to realize the full meaning of the foregoing statement. Food, by nature is the primal need. In a country such as ours, with its prodigal endownment of not only the wherewithal to raise food crops in abundance, but of natural resources in the spheres of lumber and minerals, all of which pertain to national as well as individual well-being, and because of the increase, the problem of transporting the surplus naturally arose, and through the medium of our railroad installations, same was and is being solved. It is, of course, realised that our magnificent fact that these have been and still are available in quantity far exceeding our own needs, and without doubt will continue so regardless of our population lake, river, and ocean waterways bear a large share of our carrying traffic, notwithstanding, our railroads have claimed and are filling a place both adjacent to and well removed from the sphere of ships and shipping.

NO. 1 C.P.R. LOCOMOTIVE "COUNTESS OF DUFFERIN" AT WINNIPEG.

Railways have been built in territories, the only product of which had been buffalo skins, through forests, the only denizens of which were moose, caribou, and other more or less wild creatures. Heavy financial burdens have been shouldered, and seemingly insurmountable natural obstacles have been brushed aside, as a result, Canada has become to a large extent self-sufficient and self-supporting, in addition taking her place as a world provider. Where the buffalo ranged, there are now to be seen thousands upon thousands of acres of waving grain each season, and when the harvest is in full swing, wheat alone, flows through the city of Winnipeg, Province of Manitoba, at the rate of over one and a quarter million bushels per day, equal to a solid train of cars ten miles long and more. Production is increasing with each succeeding year, all of which has been made possible by the railroad builder.



GRAND TRUNK RAILWAY LOCOMOTIVE BUILT IN THE COMPANY'S SHOPS IN 1859, AND WHICH HAULED THE ROYAL TRAIN WITH THE PRINCE OF WALES (KING EDWARD VII.) ABROAD THROUGH CANADA IN 1860.

GRAND TRUNK RAILWAY SYSTEM

THE Grand Trunk Railway System is closely allied with the early history of the Dominion of Canada and has contributed materially to her subsequent development and progress. Besides being Canada's pioneer railway, the G.T.R. has the unique distinction of being classed among the pioneer railways of this North American Continent, having been incorporated in the year 1852. In the lapsed period, it has acquired by lease, amalgamation, and purchase, numerous other roads of small to medium mileage, the whole being now embodied in one large system of over 7,000 miles. The territory served is that of the most thickly settled and productive of the Dominion—the eastern part; in addition, its ramifi-

cations through the medium of branch lines and feeders are so comprehensive in scope as to serve efficiently the requirements of industry and satisfy fully the lust for health and recreation on the part of those on the lookout for opportunity.

Inception of the Road

No chapter in Canadian history makes more interesting reading than that relating to the inception of the Grand Trunk Railroad. The story takes us back from the present day of high powered locomotives, of luxurious passenger cars with interiors of African mahogany and fitted with every known safety device, to a time when transportation was in a very primitive state.

After the completion of the first steam railway on the American continent—the Baltimore & Ohio, in 1828, the little colony of Lower Canada projected a line from Laprairie to St. John's, Quebec, linking the Richlieu and St. Lawrence rivers and providing a through rail and water route between Montreal and New York. This was opened in 1836. The rails were of wood with flat pieces of iron spiked to them. The first locomotive used on the line was known as the "Kitten," but the engine proved refractory and horses were substituted for it. It is related, however, that on practical advice being obtained, the engine was pronounced to be in good order, requiring only "plenty of wood and water." The opinion proved correct, as the "Kitten" later attained a speed of 20 miles an hour. This little road was afterwards taken over by the Grand Trunk and may be said to constitute the beginning of the present corporation.

So little progress was made, however, in railway construction between 1836 and 1850 that in the latter year there were only fifty-five miles of railway in all the provinces. Government guarantees gave an impetus to the work at this period and

C.P.R. A TRANSCONTINENTAL ROAD. DRIVING THE LAST SPIKE AT CRAIGALLACHIE, NOV. 7TH, 1885.

on request of both the Upper and Lower Provinces—Confederation was still fifteen years distant—the Grand Trunk System was incorporated to give the country real railway facilities. Some construction work had been done on a railway planned to link up Montreal with the Atlantic seaboard at Portland, thus securing the advantages of being open for traffic all the year round. Railway work was also going on in what is now known as the Province of Ontario. The prospectus of the Grand Trunk Railway was issued when arrangements for the fusion of existing companies were concluded. Seven members of the Executive Government of Canada were on the Board of Directors, together with powerful financial representatives of London, England. Baring represented one banking house, and Glyn another, and on the issuance of stock there was great disappointment among those who failed to be allotted the amount asked for.

First G.T.R. Meeting

The first meeting of the Grand Trunk Railway Company was held in the city of Quebec on Monday, July 11, 1853, at which the Board of Directors were elected as follows:—

In London: Thomas Baring, M.P.; Geo. Carr Glyn, N. Wollaston Blake, Robert McCalmont-Kirkman, D. Hodgson, Wm. Thompson, M.P.

In Canada: Hon. John Ross, Benjamin Holmes, M.P.; Hon. Francis Hincks, Hon. E. P. Tache, Hon. James Morris, Hon. Malcolm Cameron, Hon. Peter McGill, Hon. R. E. Caron, Geo. Crawford, M.P.; W. H. Ponton, R. J. Whittemore, and Wm. Rhodes.

The plans of the company called for the completion and operation of the lines of railway between Montreal and Portland, via Richmond and Sherbrooke; the building of a line from Riviere du Loup, via Point Levis to Richmond; the bridging of the St. Lawrence at Montreal, and the extension of the line from Montreal to Sarnia. The Government directors were afterwards dropped from the board but, in spite of its many financial trou-

GRAND TRUNK STATION AT TORONTO IN 1857. —From a painting by W. Armstrong.

bles, the scheme as outlined was completed, and, needless to say, assisted materially in the development of the territory which it served.

Sectional Development

Various sections of the road were opened as follows: From Portland to Montreal, in 1853; from Richmond to Quebec in 1854; from Montreal to Toronto in 1856; from Toronto to Sarnia in 1858. The original system was completed in 1859 when the Victoria tubular bridge over the St. Lawrence at Montreal was opened for traffic. The line from Detroit to Port Huron was leased in 1859, the Champlain lines in 1863, and the Buffalo and Huron in 1867.

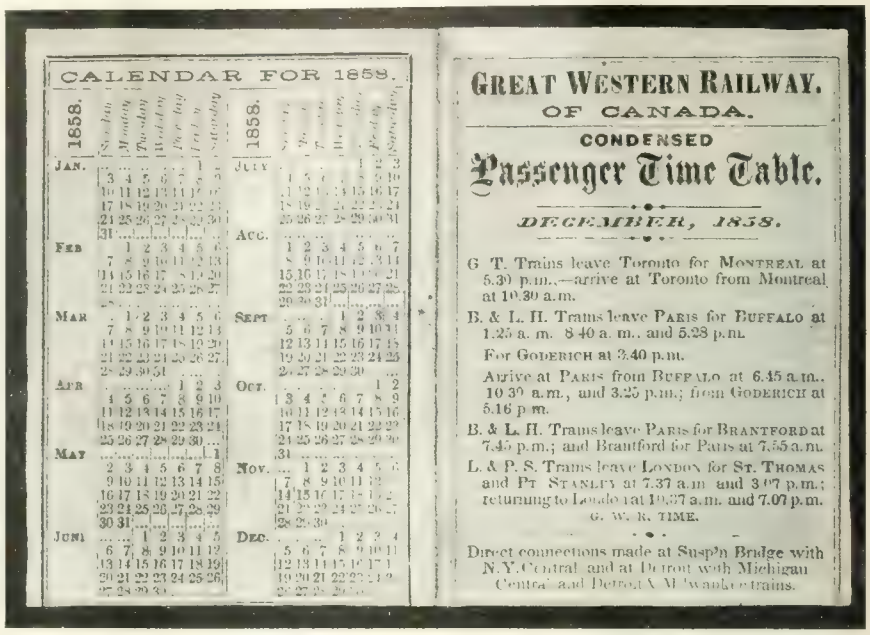
A turning point in the railway's history came in 1867 when Sir Henry Tyler visited Canada and under instructions of the Board of Directors made a special inspection and report regarding existing conditions and future prospects. The report urged the extension of the railway through to Chicago—then the growing emporium of the Great West—recording, as it did, a population of 220,000 souls in 1867, with "a commerce that was one of the marvels of the age." Its commerce has increased proportionately since.

The Matter of Track Gauge

The original gauge of the road was 5 ft. 6 in., except that portion between Port Huron and Detroit, which was 4 ft. 8½ in. Sir Henry Tyler advised that the former be made standard, and the latter for the 60 miles between Port Huron and Detroit be changed to conform thereto. However, in 1874, the gauge of the entire road was altered to the present standard of 4 ft. 8½ in., so as to conform to the practice of North American railways generally, not to speak of the many benefits derivable and economies procurable from the facilities arising from unrestricted car interchanges. The new line to Chicago was completed and opened for traffic in December, 1881, being re-organized in 1900 under the name of the Grand Trunk Western Railway Co., and financed at the same time so as to provide cash for laying the second main track; the latter was practically completed by December, 1903.

As the result of severe competition bethemselves, the Grand Trunk and the Great Western Railway of Canada amalgamated in 1882. The Great Western controlled lines from the Niagara River to Detroit and Sarnia, as well as the line of the Detroit, Grand Haven & Milwaukee Railway Co., which was built across the fertile State of Michigan from Detroit to Grand Haven, Mich., a port on the lake opposite the city of Milwaukee, Wis. The mileage of the Great Western at the time was 838 miles, and that of the Detroit, Grand Haven & Milwaukee, 189 miles, a total of 1,027 miles being thereby added to the Grand Trunk Railway System. During the immediately succeeding years the following roads were acquired:—

Midland Railway of Canada	472.50
Northern & North Western Ry. ..	482.5
Michigan Air Line	105.60
Toledo, Saginaw	116.41
Beauharnois Junction	19.00
Jacques Cartier Union	6.54
G. T., Georgian Bay & Lake Erie	208.29
Cobourg, Blairton & Marmora ..	14.50
Waterloo Junction	11.73
	1,437.07



FIRST DAILY PASSENGER TRAIN FROM THE EAST AT C.P.R. DEPOT, FERNIE, B.C.

The weight of rails on main lines which may be said to have started off at 60 pounds per yard, has, due to the development in rolling stock, now reached a figure almost double; replacements in fairly rapid succession involving first 70 pounds, then 80 pounds, and in more recent years, 100 pounds per yard.

Directorate Reorganized

The Board of Directors of the Grand Trunk Railway located in London, England (to which city the directorate had been transferred from Canada in 1862), was reorganized in June, 1895, with Sir Charles Rivers Wilson as president, and Joseph Price as vice-president. On January 1, 1896, Charles M. Hays (then vice-president and general manager of the Wabash Railway, St. Louis, Mo.), was appointed general manager, with headquarters at Montreal, being the chief executive official in Canada. After the new organization had assumed control, the Central Vermont Railway, with mileage of 513 miles, was acquired, included with the above mileage being the leased lines of the New London Northern Railway, extending from Londonderry, Vt., to New London, Conn., a mileage of 159.5.

In 1902, the Grand Trunk Western Railway acquired jointly with the Toledo, St. Louis & Western Railway the entire capital stock of the Detroit & Toledo Shore Line R.R., extending between Detroit and Toledo.

The next important addition to the present Grand Trunk System was the purchase of the capital stock of the Canada Atlantic Railway Company, with lines of railway extending from Depot Harbor (on Georgian Bay) to Alburg Junction, Vt., with branch lines from Glen Robertson to Hawkesbury, Ont., and from South Indian to Rockland, Ont. In 1905 a modern car ferry line was established across Lake Michigan, between Grand Haven, Mich., and Milwaukee, Wis. A similar car ferry service was also established across Lake Ontario, between Cobourg, Ont., and Charlotte, N.Y., where connection is made with the Buffalo, Rochester & Pittsburg Ry.

Among other extensive improvements added to the Grand Trunk Railway System, should be mentioned the grain elevator facilities located at various important tide water and lake terminals, including Portland, Me.; Montreal, Midland, Tiffin, Depot Harbor, Goderich, Sarnia, and Fort William; the new terminal and magnificent hotel, "The Chateau Laurier," at Ottawa; the new Montreal offices of the company, while extensive

Alfred W. Smithers was elected the first "Chairman of the Board" in January, 1910, upon the retirement of Sir Charles Rivers-Wilson from the presidency. Following the death of Mr. Hays, Edson J. Chamberlin, who had built the Canada Atlantic Railway, and was at the time vice-president and general manager of the Grand Trunk Pacific, succeeded to the presidency of the Grand Trunk System and all its subsidiaries, save the Central Vermont; of it Mr. Chamberlin became Chairman of the Board of Directors. The Grand Trunk Railway System with its subsidiary lines, exclusive of the Central Vermont and Grand Trunk Pacific, has now a mileage of 4,785 miles, and owns and operates the following rolling stock, in addition to service, equipment, and locomotive and car shops at strategical points.

Locomotives	1,373
Passenger Cars	1,196
Freight Cars	46,430

The capital of the System, again omitting the Central Vermont and the Grand Trunk Pacific, is $450,902,895.

System Mileage Detail

The Grand Trunk Railway System as now constituted, commences at the eastern termini of the main lines across from the city of Quebec on the St. Lawrence River; at Portland, Maine, on the Atlantic Coast; and at Rouse's Point, on Lake Champlain; extending from the first-named along the shore of the St. Lawrence to Richmond, P.Q., where is formed the junction with the line from Portland, thence running westerly, being joined at St. Lambert by the main line from Rouse's Point, and crossing the St. Lawrence River to Montreal by way of the Victoria Jubilee Bridge. From Montreal the line continues westerly through the thickly settled country along the north shore of the St. Lawrence River and Lake Ontario to Toronto, from thence with diverging lines to the south and west to the fertile Niagara Peninsula, to Niagara Falls and Buffalo, to Windsor and Detroit, to Sarnia, to Niagara Falls and Buffalo, to Windsor and Detroit, to Sarnia and Port Huron, and Chicago, and northerly from Toronto to the ports of Goderich, Kincardine, and Southampton, on Lake Huron; to Wiarton, Owen Sound, Meaford, Collingwood, Midland, and Depot Harbor, on the Georgian Bay; and through the now famous "Highlands of Ontario" to North Bay. A glance at the railway map of Canada, and particularly that relating to the Province of Ontario, will show how thoroughly and completely this pioneer railroad has established its numerous feeders at points of advantage. Of its five main lines from east to west, a total of 650 miles is double-tracked, constituting thereby a claim to being the only double-track railroad in Canada, which reaches a majority of industrial centres.

VICTORIA TUBULAR BRIDGE, MONTREAL. GRAND TRUNK RAILWAY SYSTEM OPENED FOR TRAFFIC BY H R H THE PRINCE OF WALES, AUGUST 25TH, 1860.

improvements have been made to the great bridges owned by the railroad, including the reconstruction of the Victoria Jubilee bridge across the St. Lawrence at Montreal.

The presidents and general managers who served the company during various terms are as follows:—

Presidents

Hon. Jno. Ross—1852-1862.
Sir Edward Watkin, Bart.—1862-1869.
Richard Potter—1869-1876.
Sir Henry W. Tyler—1876-1895.
Sir Charles Rivers-Wilson—1895-1910
Charles M. Hays (elected)—1910-1912.

General Managers

Sir C. P. Roney (managing director)—1853.
T. E. Blackwell (managing director)—1853-1862.
C. J. Brydges—1862-1874.
Sir Joseph Hickson—1874-1890.
L. J. Seargent—1891-1896.
Chas. M. Hays—1896-1901.
Geo. B. Reeve (one year)—1901.
Chas. M. Hays (vice-president and general manager)—1902-1910.

Service in Terms of Population

In the forty principal cities and towns of Canada there is a total population of 2,918,788. These figures are given in the publication "Canada, the Country of the Twentieth Century," prepared by Watson Griffin, and issued from Ottawa by the authority of the Minister of Trade and Commerce, Sir George Foster. They are based upon estimates furnished by the various city clerks and city assessors, and may be considered approximately correct. An examination of these statistics shows in a very striking fashion the notable part which the Grand Trunk System plays in the commercial life of the Dominion. The cities and towns served by the railway and steamship lines owned and operated by the Grand Trunk System have a population, according to these official statistics, of 2,606,435. The Grand Trunk thus serves over 89 per cent. of Canada's urban population grouped in its forty principal centres. In addition, it serves hundreds of communities with populations of less than 12,000, which is the minimum figure for inclusion in the Watson Griffin list.

Road's Interest in Its Apprentices

The education and training of its apprentices is an important feature of the operating side of the G.T.R. activities. At each of the locomotive and car building and repair shops distributed over the System, instructors are employed, their duties being to give both theoretical and practical training to the lads on the payroll in the various branches of the motive power side of railroading. Much success

has resulted from the initiation of this scheme, and due to the fact that an examination is held annually in which the apprentices from all over the System compete for prizes offered by the management, not only is a healthy rivalry created, but the ultimate effect is such that quite a little army of highly skilled mechanic is each year added to the productive capacity of the Dominion to the end that we are all the time becoming more fit as a manufacturing community to not only hold our own, but take and maintain a competitive place in the arts, crafts, and manufactures of the world.

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THE CANADIAN PACIFIC RAILWAY

PERHAPS the chief cause of Canada's development in recent years, and still operative in accelerat-is still operative in accelerating degree, may be traced to the construction of the Canadian Pacific Railway from Montreal through to the Pacific Coast. The work was undertaken in the face of almost insurmountable difficulties at a period quite early after Confederation, and when both the agricultural and mineral wealth of our Great West were practically unknown and, therefore, unappreciated. It has been stated that without Confederation the construction of a railway uniting the Maritime Provinces with the then Upper and Lower Canada, and the latter with the almost unpeopled North-west Territory and British Columbia, would have been delayed for quite a number of years. Further, we understand that the construction of a railroad to link up Eastern Canada with the seaboard of British Columbia was among the inducements held out to the latter to enter into the pact of Confederation.

However these may be, it is known that the Federal Government in the decade or more following Confederation had under consideration a number of schemes whose objective was the construction of a transcontinental line, but nothing came of them, and not until the Canadian Pacific Syndicate signed a definite contract to proceed with and complete the work were the hopes of those concerned likely to be realized. Not withstanding the now spectacular success of the great undertaking, opinions were freely expressed at the time that even if it were ultimately finished, "the net profits would be insufficient to pay for the axle grease." In the light of Canada's present engineering capacity and length of purse, the launching of a similar proposition and its rapid and successful accomplishment would not be considered much beyond the commonplace, but at that early period in our national career, the engineering and financial problems were of a stupendous nature, particularly the latter, evidence of which is to be found in the fact that it was "nip and tuck" whether not only the C. P. R. failed, but whether in such a circumstance our banks and manufacturing establishments then operating would not also be caught in the maelstrom. Our national credit, in the light of early future development of our agricultural, mineral, and industrial resources was, needless to say, largely at stake.

VISIT OF KING GEORGE AND QUEEN MARY (THEN DUKE AND DUCHESS OF YORK), TO THE VICTORIA JUBILEE BRIDGE, MONTREAL, OCTOBER 16TH, 1901. KING EDWARD DROVE THE LAST RIVET IN THE OLD VICTORIA TUBULAR BRIDGE IN 1860.

Building the Transcontinental Road

In brief, the undertaking of constructing a transcontinental road as agreed to between the contractors and the Government was as follows:—A line was to be built and completed between Montreal and Port Moody, B.C., within a period of ten years, towards which the syndicate were to be subsidized to the extent of $25,000,000 in cash, and were to be given a land grant of 25,000,000 acres in the North-West. In addition, the Government were to hand over to the C.P.R. an existing railway line in British Columbia, of some

VICTORIA JUBILEE BRIDGE, MONTREAL GRAND TRUNK RAILW AY SYSTEM—OPENED FOR TRAFFIC, DECEMBER 13TH, 1898.

225 miles in length, also a railway line between Winnipeg and Lake Superior, of some 425 miles in length, both lines being at the time under construction by the Government. The C. P.R. syndicate consisting of R. B. Angus, George Stephen, and Donald Smith —the two latter being afterwards known as Lord Mount Stephen, and Lord Strathcona, respectively, had been interested in the reorganization of an American railroad—afterwards known as the St. Paul, Minneapolis and Manitoba Railway Co., and not only had their efforts been crowned with success, but they had individually realized large fortunes in the process. As a consequence, it was felt that they could be trusted to make good in whatever else they undertook, even to the building of a transcontinental railroad across the Dominion.

The initial move of the syndicate was to organize the Canadian Pacific Railway Co., this being followed by the latter assuming the construction contract already noticed. Work was started in the year 1881, with William Van Horne —later, Sir William Van Horne—in general charge, and was pursued vigorously west of Winnipeg and along the north shore of Lake Superior, with a view to early completion. Some sections of the work were naturally more difficult to negotiate than others, and therefore cost more comparatively, a circumstance and experience common alike to railroad construction and all classes of engineering undertakings on a big scale.

It was neccessary, of course, that the company find a market for its securities, and in view of the heavy drain on its financial resources as a result of the unforeseen expenditures required to overcome construction obstacles, it was highly important that same be readily available. Unfortunately this was not so, largely due to the efforts of opponents of the enterprise, who took advantage of every emergency to criticize the project adversely, and generally throw cold water on it without stint. Towards the end of 1883, the company's exchequer was practically empty, and to keep things going it became necessary for Angus, Stephen, and Smith to lend their credit until a market for the company's securities could be found, or additional Government assistance be forthcoming. Early in 1884, the Government loaned the company the sum of $30,000,000, taking as security everything available whether in the form of road already finished or in process, and all other manner of assets possessed by it.

The disbursements during the following year—1884 were, however, on such a big scale that, before its close, the $30,000,000 loan received from the Government had become exhausted and the financial position of the company had become worse than ever, if that were possible. At this point it should be borne in mind that quite substantial progress had been made in the building of the road, and that the money spent had gone for that purpose. Little wonder is it then that with financial disaster again staring the company in the face that George Stephen, the President of the C.P.R., and Donald Smith his associate, made personal loans, and gave personal guarantees to an extent that jeopardised their individual fortunes, all in order that the company might not only continue the work of construction, but bring it to a successful conclusion.

THE GRAND TRUNK RAILWAY SUSPENSION BRIDGE OVER THE NIAGARA GORGE. AN ENGINEERING ACHIEVEMENT OF THE PAST HALF CENTURY.

Despite the desire of the then Premier, Sir John A. Macdonald, to co-operate to the fullest extent possible so that the road might be completed, he evinced a hesitancy to commit the Dominion Government still further by way of loan advances. Politics and personalities are understood to have also been active against further aid. In the end the reputation of our country in the eyes of the world, and instinct as to what the completion of the road would mean to our future progress, prevailed; as a result, a temporary additional loan of $5,000,000 was made in the early part of the year 1885.

Completion of the Road

This last loan enabled the road to be completed through to Port Moody, the last rail being laid and the last spike driven by Lord Strathcona. The line

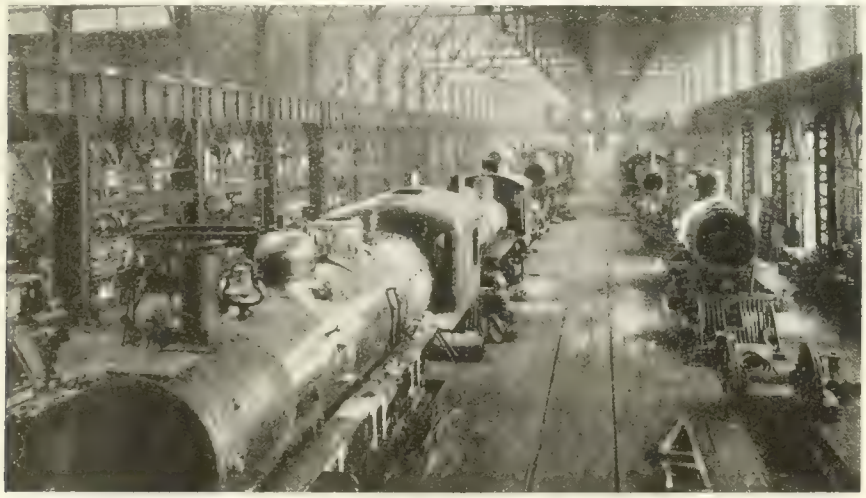
MOUTH OF THE ST. CLAIR TUNNEL, AN INTERNATIONAL LINK BETWEEN CANADA AND THE UNITED STATES. THE G.T.R. TRAINS ARE HAULED BY ELECTRIC LOCOMOTIVES THROUGH THIS TUNNEL, WHICH CONNECTS SARNIA, ONT., AND PORT HURON, MICH.

was finished in four years instead of ten which speaks volumes for the energy displayed by those most immediately concerned and interested. In the course of the year 1885, a market was found for the Company's Bonds to the amount of $35,000,000 out of the proceeds of which the government was paid in full, except that, in part payment, the latter consented to take back some 7,500,000 acres of land as representing in value $10,000,000 of the advances.

Dawn of C.P.R. Prosperity

Gradually, with the construction of the transcontinental road off its hands, the Canadian Pacific Railway Co., developed stability, so much so that in the year 1894, when so many railroads on this continent went into the hands of receivers, the worst that happened as far as the C.P.R was concerned, was the suspension of its 5 per cent. dividend for the latter half of that year, and the first half of 1895. Within twelve months, however, payments were resumed, and the progress made since, has been both steady and substantial. In 1890, the net earnings amounted to $6,300,000; while

DOUBLE TRACK MAIN LINE ON THE GRAND TRUNK RAILWAY SYSTEM BETWEEN MONTREAL AND CHICAGO.



LOCOMOTIVE ERECTING DEPARTMENT, C.P.R. ANGUS SHOPS, MONTREAL.

for the year ending June 30th, 1916, the net earnings, excluding those of the Pacific Coast Steamships, Commercial Telepgraph, and News Department, amounted to $36,996,435.44. In the early days of the road's operating activities, the capital stock of the C.P.R. amounted to $65,000,000, and as showing the growth and progress of the road since then, no better evidence could be forthcoming than that which the present capital stock of $260,000,000 (ordinary) demonstrates.

C.P.R. Mileage

The total length of the road as first planned betwen Montreal and Port Moody, B.C., was 2,285 miles; to Vancouver, the present Western Terminal, it is 2,898 miles. The original line ran through Winnipeg, Brandon, Regina, Moose Jaw, Medicine Hat, Calgary, through the Kicking Horse Pass by Banff and Sicamous Junction to Vancouver, but since then a perfect network of lines has been run north and south of it from Winnipeg or from stations some distance west of Winnipeg. There can be little doubt that in the near future an extension will be made in a north-westly direction through the Peace River District, and thence ultimately find an outlet by some comparatively easy northern pass through the Rockies to the Pacific. Already by the Southern extension the company has found another pass through the Rockies—the Crow's Nest Pass, which established the important towns of Lethbridge and MacLeod, and brought into notice and service the coal deposits of Southern British Columbia, and also gave another line of access to the fruit-growing valleys of British Columbia, besides those already in existence from Revelstoke and Sicamous Junction.

The mileage of the C.P.R. lines, including those owned, leased, operated for owners, on which running powers have been granted, etc., according to the Annual Report for the year ended June 30, 1916, is as follows:—Eastern Division, 1609.4 miles; Ontario Division, 1508.6; Lake Superior Division, 1110.2; Altantic Division, 783.5; Manitoba Division, 2463.8; Saskatchewan Division, 2150.1; Alberta Division, 2530.3; British Columbia Division, 1221.3. Mileage included in traffic returns as at June 30th, 1916, totalled 12,993.6, which together with other lines operated of mileage 383.6, makes a grand total of 13,377.2 miles. Of controlled roads, mileage of 4228.3 and 627.7 belong to the Minnea-

GENERAL VIEW OF THE C.P.R. ANGUS SHOPS, MONTREAL.

polis, St. Paul & Sault Ste. Marie, and Duluth, South Shore & Atlantic Railways respectively.

Double Tracking and Grade Reduction

Double tracking of the System has now been in progress for a considerable number of years, as has also been the modification of grades, more especially in the West, and there is little doubt that very great progress as regards the former would have been recorded at this date had not the war supervened. The construction of the Connaught Tunnel noticed later was undertaken with a view to grade modification.

Physical Assets

The assets of the road as per the statement already referred to amount to the substantial total of $960,217,057.89, same including railways, rolling stock, ocean, lake and river steamships; lands, locomotive and car shops, hotels, offices, investments, cash on hand, etc. The rolling stock belonging to the company at 30th June, 1916, was made up as follows: Locomotives, 2,255; first and second class passenger cars, baggage cars, and colonist sleeping cars, 2,183; firt class sleeping, dining and cafe cars, 498;parlor cars, official, and paymasters' cars, 100; freight and cattle cars, all kinds, 87,108; conductors' vans, 1,420; boarding, tool and auxiliary cars, and steam shovels, 6,867. Of the first and second class passenger cars, baggage, and colonist sleeping cars, 12 on the St. John and Boston line, 14 on the Montreal and Boston line, and 19 on the Toronto, Hamilton, and Buffalo line, are outside owned to the extent of 80.04, 68.33, and 63.96 per cent. respectively.

C.P.R. CONNAUGHT TUNNEL ENTRANCE.

Revenue From Land Owned

Naturally with the settlement that has taken place in Western Canada, during the past two decades or less, the land received when construction of the road was undertaken has become a very material source of revenue, and as a comparatively trifling amount of the land then received has so far passed out of the company's control, it will be apparent that income from that quarter will continue for a long period of years to supplement that derived from the purely transportation side of the C.P.R. business.

NEW C.P.R STATION IN QUEBEC CITY.

C.P.R. Welfare Activities

Welfare of the country, also welfare and well-being of its myriad employees, on the road, on board its ships, in its shops and offices, and of the settlers on it lands, are outstanding features of Canadian Pacific Railway Co. administration, and in this war time exemplification has been had of its Empire spirit in ways and manner too numerous to detail here. The quite recent offer of a loan of $10,000,000 to the Imperial Munitions Board for munitions purchases, and its proposition to raise a sum of $200,000,000 on the road's credit for behalf of the Imperial Government, are perhaps sufficient to cite here. As in the case of the Grand Trunk Railway System, the C.P.R. is also in the marine field, and that on a quite comprehensive scale, owning as it does fleets of ships not only on our great and small inland lakes, but palatial vessels of heavy tonnage plying on our British Columbia coastal waters, and on the broad Atlantic and Pacific Oceans.

Connaught Tunnel

The year 1916 was an interesting one in the history of the Canadian Pacific Railway. It was a year of progress, however, even though the Dominion was still struggling in the great war. As compared with the previous year there had been a tremendous revival of trade. Several important works for which appropriations were made before the war, realized completion, the most important being that of the Connaught Tunnel through Mount MacDonald, in the Selkirk Mountains. The accomplishment of this task is a triumph of engineering and labor seldom equalled anywhere. It is the longest double tracked tunnel in

C.P.R. WINDSOR STREET STATION, MONTREAL.

the Western Hemisphere. The length is about 5 miles. The work was performed in two and a half years, constituting a world's record. The number of men employed was about 600. The Connaught Tunnel to the C.P.R. means the elimination of several miles of snowsheds, reduction of distance connecting railway points, also making effective a big grade reduction. The cost of the undertaking was $6,500,000. The amount of material taken from the bore was approximately 750,000 cubic yards, weighing in round figures over 1,500,000 tons. Much of the centre portion of the bore was through solid rock.

Previous to this achievement, the longest railway tunnel on the American Continent was the Hoosac Tunnel, 4¾ miles long, on the New York Central Railway line. The work of the Connaught Tunnel began in January 1914 and progressed steadily until completion. An interesting feature of the boring operations with regard to the soft material at the start for the main tunnel at the western end was the use of hay to knit together the earth and water which oozed forth like a bleeding wound as the excavation proceeded. The hay was placed in handfuls between the wooden supports used to keep the shafts from falling in.

The tunnel which is 29 feet wide and 23 feet high follows a straight line under Mount MacDonald, emerging in the Beaver Valley at a point about 1,000 feet below the present line. The eastern entrance is directly below Hermit, a station just east of Rogers Pass. The highest point reached in the tunnel is 3,795 feet above the sea level, and 4,065 feet below the summit of MacDonald Peak. The passage through the mountains has a grade of 1 per cent. up to the interior summit. Previous to the war the C.P.R. annually spent from $25,000,000 to $35,000,000 on the development of the West, and the excavation of the Connaught Tunnel during the period of hostidlities shows that Canada is strong to advance at home as she is undoubtedly strong to fight abroad.

C.P.R. "IMPERIAL LIMITED" PASSING ST. ANNE'S, P.Q.

On July 17, 1916, his Royal Highness, the Duke of Connaught, then Governor General, paid a visit to the tunnel and complimented the Canadian Pacific Railway on the progress that the company was making. He baptized the undertaking as "The Selkirk Tunnel," but some weeks later at the request of Lord Shaughnessy, His Royal Highness consented to have the tunnel called after himself.

Recent Station Betterments

Among recent improvements to stations along the Canadian Pacific, the most notable are the new stations erected at Quebec and North Toronto. The latter on upper Yonge Street, was formally opened on June 14th, 1916, when Mayor Church started the first train running between the new terminal and Montreal, and declared the station to be opened for traffic. Mayor Church congratulated the Canadian Pacific on its foresight and enterprise, dealt with the good relations that existed between Toronto and the Company, and referred to the offer of the old station to the city, to be used as a market place. Amongst the speakers was Sir James Carroll of New Zealand who, in expressing his felicitations, described the C.P.R. as a powerful factor in the Empire.

The design of the new station at North Toronto is a free adaption of the Italian Renaissance to the requirements of the present day. It is a single-storey building faced externally with Tyndall limestone. A spacious waiting room 70 by 50 feet of lofty proportions occupies the centre portion of the structure. To the east and west of this central block are two subsidiary wings devoted to general station facilities. To the north of the waiting room is the concourse, opening from which is the midway 20 feet wide by 150 feet long, passing underneath the tracks and from which access is had to the various overhead platforms. Flanking the building at its north-west corner is the clock tower. The vestibule under the tower leads to the concourse. A sidewalk (protected by a marquice), is laid along the south and west sides of the station. Wherever possible, and there are but few exceptions, all materials and labor employed in the construction of C.P.R. buildings are of Canadian and British origin; Canadian timber being used for all woodwork whether as rough lumber or finished millwork.

The new depot at Quebec, opened on August 10th, 1916, is a triumph of modern railway station construction. The building has a central block and two wings, is akin to the old French Chateau style of architecture, and is admirably adapted to the quaintness of our old French-Canadian city. On the occasion of the formal opening, the Mayor of Quebec referred to the advancement of the city in glowing terms, and a tribute was paid to the interest which the

C.P.R. EMPRESS HOTEL, VANCOUVER, B.C.

C.P.R. took in the welfare of the country.

The walls of the spacious waiting hall of the new Canadian Pacific Railway are beautified by a series of mural decorations representing the principal mountains from Calgary to Vancouver. The decorations are the work of Mrs. Adelaide Langford, an artist with a wide reputation.

Railroad Acquired

Recently the C.P.R. acquired the Lake Erie & Northern Railway, and by doing so brought their lines into touch with a flourishing and interesting territory in Western Ontario, running from Galt to Port Dover. The new line has connection with the Canadian Pacific main line at Galt and runs in conjunction with the G. P. & H. Railway which gives access to Berlin and intermediate points, as well as direct connection with Port Dover, Brantford, and neighboring towns. The district in which the L. E. & N. runs will benefit much by the new life which the C.P.R. is putting into the train service there. The transportation of farming produce, so abundant in that part, will be facilitated, and tourists who wish to travel in the beautiful locality will find a convenient and satisfactory service. During the year a new railway station was built at Brantford as a result of an agreement between the C.P.R. and the Hamilton Railway. The new station serves both.

Changes in Executive Personnel

Of those who took an active part in the building of the C.P.R., and helped thereafter to lay the foundations for the gigantic and prosperous corporation we find to-day, almost all have gone to their rest, R. B. Angus and Lord Mount-Stephen being possibly the only ones still with us. New blood as a result has had to be requisitioned, but all of it has the attribute of having been tried and tested in the doing and direction of big things; in consequence no setback has been experienced, rather has it been otherwise, a result largely if not wholly due to the keen judgment in selection displayed by the Chairman of the Board of Directors and President of the Company, Baron Shaughnessy, K.C.V.O.

C.N.R. WHEAT TRAIN, STATION AND ELEVATOR.

CANADIAN NORTHERN RAILWAY

DURING the closing years of the last century the necessity of opening up undeveloped lands in the West for settlers in addition to what the C.P.R. had already done, created a desire for more railways. Charters had existed for long, but the holders had not been able to interest and convince capital to make the investment. However, in 1896, William Mackenzie and Donald Mann, who had already done considerable railroad construction in various parts of Canada, undertook to build a railway in Manitoba, their charter being that of the Lake Manitoba Railway & Canal Co. On Jan. 3, 1897, the Gladstone Winnipegosis section, a distance of 123.4 miles, was opened for traffic, but the work did not stop there, for the same year saw the Winnipeg-Lake Superior line begun. On Nov. 28, 1898, the Winnipeg-Port Arthur line between St. Boniface and Marchand was opened, a distance of 45.4 miles. On Nov. 15, 1899, the Sifton Junction-Swan River line was opened for traffic.

The Canadian Northern Railway, which was incorporated in 1899, had, at the end of this year, 252.6 miles in operation and fully 500 miles under construction. The success which had attended the guarantee method of aid in Manitoba, inspired the Saskatchewan Government to follow the lead given and develop that Province by the construction of railways. In 1900, the Swan River-Prince Albert line as far as Erwood was opened for traffic a distance of 92.5 miles, also the first section of the main line to Edmonton-Gilbert Plains to Grandview, 26.6 miles, was thrown open. Following came the Marchand-Beaudette extension of the Winnipeg to Port Arthur line; this extension covered 106.1 miles. At the end of 1900, 477.8 miles of road were in operation.

In 1901, the Northern Pacific Railway lines in Manitoba were acquired by the Manitoba Government and leased for a long term of years to the Canadian Northern. The Winnipeg-Port Arthur line was extended from Beaudette to Fort Francis, and, at the close of the year, there were 884.3 miles in operation. Other activities besides actual railroad construction claimed their measure of attention in 1901, an elevator of 1,500,000 bushel capacity being built at Port Arthur, Ont., to handle the grain shipped from the newly-opened territories. In 1902, the Beaver to Gladstone line, 17.8 miles, was constructed, giving a through connection for lines built north and west of Gladstone, with Winnipeg. The Winnipeg to Port Arthur line was opened for traffic in the same year, making a total of 1,296.9 miles in operation. During 1901 and 1902, the James Bay Railway Junction line was built out to Parry Sound, Ont., to a junction with the Canada Atlantic Railway. The Great Northern Railway and the Chateauguay & Northern Railway, in Quebec Province, were acquired in 1903, and construction of the Halifax &

C.N.R. STATION, WINNIPEG, MAN., BUILT ON THE SITE OF OLD FORT GARRY.

C.N.R. COAL DOCKS AT PORT ARTHUR, ONT.

Southwestern Railway in Nova Scotia was commenced.

In 1904, considerable development work was undertaken. The C.N.R. elevator at Port Arthur was increased to 7,500,000 bushels capacity; the Winnipeg-Prince Albert north line was extended from Erwood to Melfort, 107.5 miles; the Grandview-Kamsack section of main line was opened for traffic, also the Winnipeg-Oak Point line for a distance of 54 miles. The Toronto-Sudbury line was commenced, and at the end of 1904, there were 1,932.3 miles of road in operation.

The main line, Kamsack to Edmonton, 546.3 miles, was opened for traffic in 1905, while in the same year Brandon was entered by the line from Portage la Prairie. At the end of 1905, there were 2,846.9 miles in operation. In 1906, the Qu'Appelle, Long Lake & Saskatchewan Railway connecting up Regina, Saskatoon and Prince Albert, was acquired. The Winnipeg-Prince Albert line by way of Melfort was opened, thus giving Saskatoon the first competitive line with Winnipeg and the East. In the same year the Toronto-Sellwood line through Parry Sound and Sudbury was opened for traffic. The Quebec & Lake St. John Railway, and the Niagara-St. Catharines and Toronto Railway were also acquired. At the close of 1908 there were 4,361 miles in operation. The Saskatoon-Calgary line was opened as far as Rosetown, Sask., in 1909, and during the same year the Duluth, Rainy Lake and Winnipeg Railway connecting Fort Francis to Virginia, was also in operation. The Central Ontario Railway was acquired and the Hawkesbury-Ottawa line opened for traffic. At the end of 1909 the mileage totalled 4,859.6 miles.

The next few years saw further important developments in the C.N.R. system. In 1910 the Saskatoon-Calgary line was extended to Kindersley, and the Prince Albert-Shellbrook line was opened for traffic. The Bay of Quinte Railway, the Brockville, Westport and Northwestern Railway, and the Irondale, Bancroft & Ottawa Railway were acquired. The "Royal" Line Atlantic steamship service, now a part of the Cunard System, was inaugurated in 1910. The developments in 1911 included the opening for traffic of the Vegreville-Drumheller, North and South lines in Alberta; Hudson's Bay Junction-Le Pas line; the Radville Antar (Moose Jaw) line, and the Shellbrook-Big River line. The Duluth, Winnipeg and Pacific line was also opened for traffic into Duluth, and the Toronto-Ottawa line was opened at Deseronto, Ont. The Saskatoon-Calgary line was extended to Alsask. At the close of 1911 there were 6,491.7 miles of road in operation.

In 1912, the Edmonton-Athabasca Landing line was opened for traffic, and the capacity of the C.N.R. elevator at Port Arthur was increased to 10,000,000 bushels. The Shellbrook-Denholm line and the Gravelbourg and Elrose lines were opened for traffic in 1913, making 6,967.5 miles in operation. On Jan. 1, 1914, the last spike was driven in the Montreal-Port Arthur line at Little White Otter River. The Saskatoon-Calgary line and the Toronto-Ottawa line were opened, the latter road giving connection between Montreal, Quebec, and points in Quebec Province. There were now 7,358.2 miles in operation. On Jan. 23, 1915, the last spike was driven at Basque, B.C., a point 182 miles east of Port Mann on the Transcontinental line between Quebec and Vancouver. At the end of 1915, there were approximately 10,000 miles of road in operation.

The transcontinental system is now an accomplished fact and necessary construction work was undertaken to attain this while the war was in progress. Because of the great conflict in Europe, railway finance has not gone ahead as fast as has railway construction, and therein lies the germ of the railway problem of the present day. One of the reasons for the construction of the C. N.R. line connecting the Prairie Provinces with the Pacific Coast was that it would provide an outlet for wheat and other commodities to the coast for transportation to Europe via the Panama Canal, as now recommended by the Dominion's Royal Commission in its recent reports on Canada to the British Government. The opening up of new territory for settlers and the development of inter-provincial trade were other important considerations. The opening up of the Saskatchewan Valley for American farmers particularly has proved of inestimable advantage to the people of Canada from a production point of view. The C.N.R. has also been a means of creating competition, thus tending to steady freight rates. It has also assisted in the rapid growth of population and increase in production of a large territory.

The lines of the C.N.R. are well located in view of traffic conditions and the construction of the track has been

C.N.R. SPECIAL TRAIN OF FIFTEEN COACHES DRAWN BY ONE LOCOMOTIVE WHICH INAUGURATED A TRANSCONTINENTAL SERVICE FOR ITS PARTICULAR ROAD.

C.N.R. WATERSIDE TERMINALS AT PORT ARTHUR, ONT.

accomplished at a comparatively low cost. Easy grades are a feature of the system and an important one particularly through the Rockies. Had it not been for the war, the C.N.R. would most probably have been able to operate the road profitably, but the financial situation during the past three years has been such that the position of the System has called for Government assistance in some form. It is likely that some means will be found to assist the road until the situation is again normal. Canada went into the building of railways, in advance of settlement, as a business to induce settlement, and that settlement is certain to come within a reasonable number of years.

To carry the road over during the intervening period, that is, until the newly-opened territory becomes a source of revenue, in the form of freight principally, some assistance is necessary. It is generally conceded that in a few years the C.N.R. will be a valuable property. The territory served will become quite thickly populated, and production from the soil in a variety form will naturally increase. This will, of course, benefit not only the railway, but Canada as a whole.

CANADIAN GOVERNMENT RAILWAYS

CANADIAN Government-owned railways in operation include the Intercolonial, which extends from the Atlantic Ocean ports of Halifax, St. John, Sydney, and North Sydney to Montreal; the Prince Edward Island Railway, extending from Tignish to Georgetown, 158.60 miles, and from Charlottetown to Murray Harbor, 52.30 miles, with branches to Souris, Elmira, and Cape Traverse, a total length of road operated of 274.6 miles; the New Brunswick and Prince Edward Island Railway of 36.05 miles in length, running from Sackville to Cape Tormentine and forming a connection between the Intercolonial and the car ferry, between Cape Tormentine and Carleton Point, on Prince Edward Island; the International Railway of New Brunswick; the St. John & Quebec Railway, the Hudson Bay Railway, and the National Transcontinental Railway.

The Intercolonial is the chief of the lot now operating; therefore it will be in order to feature it at least first and in any case most prominently. "Railways and tariffs were so intermingled with politics during the last half of the nineteenth century in Canada that it seemed impossible to separate them," says one writer, and whether much improvement has taken place since it may be left to the reader to judge.

Inception of the "Intercolonial"

As far back as 1835, the Intercolonial Railway project was under discussion, and not only so, but tentative surveys had been made and negotiations conducted at different times in London, England, as well as in the various provincial capitals concerned, with a view to construction being started. Until, however, the pact of Confederation had been sealed, nothing of real value had been accomplished, but action was soon to follow, for completion of the line was a plank in the Confederation platform of the Eastern or Maritime Provinces. As might be expected, more or less diversity of opinion existed concerning method and cost of operation. The final surveys were carried out by Sandford Fleming (later Sir), the exact route fixed, and details of construction generally determined.

The whole line from Halifax to Levis, opposite Quebec City, was opened to traffic on Dominion Day, 1876, at a cost to build of $22,488,000. The through distance was 675 miles. In 1898, as already referred to in the data covering the Grand Trunk Railway System, legislation was enacted and arrangements made whereby continuity of the line was maintained as far as Montreal. Great Britain was originally interested in the Intercolonial because of its convenience for the transportation of troops, and later, she became much more so by guaranteeing construction loans of something like $15,000,000, partly, it is autho-

CANADIAN NORTHERN RAILWAY GRAIN ELEVATOR AT PORT ARTHUR, ONT.

SHOWING C.N.R. ABOVE, C.P.R. BELOW, ALSO FRASER RIVER AND BRITISH COLUMBIA SIDE OF YELLOW HEAD PASS.

ritatively stated, in return for Canada waiving her Fenian Raid claims against the United States. From the like source—Sir Sandford Fleming in the History of the Intercolonial Railway—we learn that had it not been for the reckless surrender of territory by the Imperial Government under the Ashburton Treaty, the distance to cover between Montreal and Halifax would have been less by 200 miles, $10,000,000 of expenditure would have been saved, and a winter port on the Atlantic Coast secured to the Dominion.

I.C.R. Growth and Progress

As showing the growth and progress of the I.C.R. since its completion in 1876, it may be stated that the total length of road operated during the year ended March 31st, 1916, was 1518.39 miles, as compared with 675 miles in the former year; only 66.92 miles are double track, however. Passing sidings amount to 139.21 miles, while other sidings and spurs total 387.43 miles. The total capital expenditure on behalf of the Intercolonial Railway System to March 31st, 1916, amounts to $115,766,560.24. At the end of the first year's operation of the road, 421,327 tons of freight and 613,420 passengers were carried, while for the year ended March 31st, 1916, the figures are 5,447,220 and 4,124,387 respectively. Working expenses and gross earnings of $1,661,673.55 and $1,154,445.33 compare with $12,551,495.84 and $14,068,791.41 for the respective years.

As regards rolling stock, it will have become evident from the figures above quoted that a corresponding development both as to quality and quantity has taken place since 1876. On March 31st, 1916, the equipment consisted of 434 locomotives, 66 sleeping cars, 10 parlor cars, 21 dining cars, 65 colonist cars, 169 first class passenger and official cars, 96 second class passenger cars, 36 postal cars, 75 baggage cars, 26 box baggage cars, 1 air brake instruction car, 1 steam motor car, making a total of 566 passenger cars; 10,099 box cars, 192 refrigerator cars, 3,239 platform cars, 52 pulpwood cars, 55 oil tank cars, 640 hopper cars, 5 gondola cars, 376 twenty-ton coal cars, 526 Hart-Otis steel dump cars, 185 stock cars, 300 Hart convertible dump cars, 4 pit cars, 184 vans, making a total of 15,863 freight cars; 23 auxiliary cars, 1 store supply car, 2 Pintsch gas cars, 51 common snow plows, 27 wing snow plows, 2 steam rotary snow plows, 2 double track snow plows, 1 double end snow plow, 54 flangers, 22 steam cranes, 2 Rogers ballast spreaders, 1 ballast trimmer, 5 centre ballast plows, 7 side ballast plows, 4 ballast plow unloaders, 1 wing ballast spreader, 4 concrete mixers, 1 sand blast machine, 1 well boring car, 1 ditcher, 1 steam derrick, 1 hand derrick, 4 steam shovels, 1 portable rail sawing and boring machine, 2 pile drivers, 16 survey and inspection cars, 2 rail unloaders, 71 wrecking cars, 62 boarding cars, making a total of 378 work cars.

It may be mentioned at this point that the National Transcontinental Railway is associated with the Intercolonial in the official statement from which these particulars have been drawn. Since the opening of hostilities in Europe three years ago, traffic on the I.C.R. has assumed gigantic proportions; it, therefore, speaks well for the physical condition of the road as a whole that so much has been and is being accomplished with a minimum of inconvenience to shippers.

Large locomotive and car building shops of the Canadian Government Railways are established at Transcona, near Winnipeg; St. Malo, near Quebec City; and Moncton; however, only the latter is engaged on railroad work on a capacity scale. The shops at St. Malo have not been completed, although it is understood that much of the equipment is on the ground and some of it is installed. The I.C.R. shops at Moncton are well organized to secure rapid and substantial outputs of both new and repair work, and as might be expected, the welfare schemes in operation contribute material to that end. The big ocean terminals being constructed at Halifax, N.S., will also embrace the terminal of the Intercolonial there, when completed.

C N R MOUNT ROYAL TUNNEL PORTAL MODEL CITY END.

New Brunswick and Prince Edward Island Railway

Under an agreement dated March 18th, 1915, and under an Order in Council of May 12th, 1915, this railway was purchased for $270,000, becoming thereafter a part of the Canadian Government Railway System. The working expenses to March 31st, 1916, amounted to $76,844.63 and the gross earnings to $50,414.34. During the year ended as above, $24,999.97 was expended to bring the road up to the standard of the Intercolonial branch lines. The rolling stock of the N.B. & P.E.I. Railway consists of the following:—31 locomotives, 23 first-class passenger cars, 13 second class passenger cars, 7 combination second class and

baggage cars, 4 postal and smoking cars, 4 combined postal and baggage cars, 8 baggage cars, or a total of 59 passenger cars; 313 box cars, 3 refrigerator cars, 28 stock cars, 1 oil tank car, 15 Hart convertible cars, 12 coal cars, 154 platform cars, 4 vans, or a total of 530 freight cars; 11 snow plows, 8 flangers, 1 steam shovel, or a total of 20 work cars. The gauge of the road as taken over was 3 ft. 6 in.

International Railway of New Brunswick

Under an agreement, dated August 1st, 1914, and under an Order-in-Council of August 27th, 1914, a lease of this railroad was taken by the Canadian Government for a term not exceeding five years at an annual rental of $90,000, payable half yearly, with option of purchase at any time within that period for the sum of $2,700,000. The road was taken over as part of the C.G.R. System on August 1st, 1914. It is 111.30 miles in length, extending from the Intercolonial at Campbellton, N.B., to St. Leonards, N.B. During the fiscal year ended March 31st, 1916, there was expended on capital account the sum of $2,637.47 to bring the road up to the I.C.R. standard for branch lines. The working expenses for the period amounted to $116,651.38, and the gross earnings to $104,623.49, leaving a deficit of $12,027.89. In addition to the working expenses, the sum of $90,000 was paid as rental.

St. John and Quebec Railway

By Act of Parliament of date March 5th, 1912, agreement was made on behalf of the Dominion and the Province of New Brunswick, and the St. John and Quebec Railway Co., for leasing to the first-named the company's railway when fully constructed from the City of St. John, N.B., to a point of connection with the National Transcontinental Railway at or near the town of Grand Falls, N.B. The agreement provided that the railway should be completed and equipped by November 1st, 1915; further, that on construction and equipment of certain sections the Dominion Government would lease and operate same. The road extends from Centreville to Gagetown, 119.87 miles. The portion from Centreville to Fredericton was taken over for operation by the C. G. Railways on January 1st, 1915, and the portion from Fredericton to Gagetown on March 2nd, 1915. The working expenses for the fiscal year ended March 31st, 1916, amounted to $90,757.13, and the gross earnings to $57,742.71, leaving a deficit of $33,014.42.

Hudson Bay Railway

This railway will run from The Pas, Province of Manitoba—a point on the Saskatchewan River, where connection is made with the Canadian Northern Railway System—to Port Nelson, on the western shores of Hudson Bay. The work of construction for the first 185 miles from The Pas to Thicket Portage was placed under contract in August, 1911. A contract for a further distance of 68 miles from Thicket Portage to Split Lake Junction was let on September 20th, 1912, and a third contract, covering the distance, 165 miles, from Split Lake Junction to Port Nelson, on December 17th, 1912, a total distance of 418 miles. The final location into Port Nelson was completed in August, 1914, making the total length of the line from The Pas to Port Nelson 424 miles. By the end of the fiscal year, March 31st, 1916, grading had been completed to mile 378, or within 47 miles of Port Nelson; the track had been laid and the telegraph line built up to mile 241, the first crossing of the Nelson River, Manitou Rapids. The cantilever bridge at this point has a total length of 608 feet, and is to all intents and purposes finished. The right of way has been cleared to mile 395. The work of constructing the terminals for the railway at Port Nelson has been carried on by the Dominion Department of Railways and Canals with a force of men under a supervising engineer. The construction of the permanent deep water works, giving connection between the mainland and deep water by a system of steel bridges—17 spans—has made good progress. Communication with Port Nelson is afforded by means of Marconi wireless stations established there and at The Pas. The expenditure for the fiscal year ended March 31st, 1916, was $4,889,131.77, making the total expenditure up to that date, $15,749,908.43.

National Transcontinental Railway

Under an agreement, dated July 29th, 1903, and a modifying agreement of date February 18th, 1904, the Grand Trunk Pacific Railway Co. have undertaken certain obligations with respect to the construction and operation of a line of railway, wholly upon Canadian territory, between the City of Moncton, N.B., and the navigable waters of the Pacific Ocean. The railway is composed of two divisions, namely, the Eastern Division, between Moncton and Quebec City; thence westerly through the northern part of the Provinces of Quebec and Ontario, and in the Province of Manitoba, to the City of Winnipeg; the Western Division being between Winnipeg and the Pacific Ocean. The Eastern Division is being constructed by the Government, and on completion is to be leased to, and be maintained and operated by the G.T.P. who undertake to construct at their own cost, and maintain and operate the Western Division.

The lease of the Eastern Division is for a period of 50 years at a rental of 3 per cent. per annum on the cost of its construction, the first seven years of the term to be free of rent. Both divisions when completed are to be equipped with ample and modern rolling stock by the G.T.P., the initial equipment to have a value of not less than $20,000,000. By way of assistance to the G.T.P. in the construction of the Western Division, it is provided that the Canadian Government shall guarantee payment of the principal and interest of an issue of bonds of the company for an amount sufficient to produce a sum equal to 75 per cent. of the construction cost, but not to exceed $13,000 per mile in respect of the prairie section from Winnipeg to the Eastern limit of the Rocky Mountains. This limit has been established as the east bank of Wolf Creek, a point 120 miles west from Edmonton, Alta.

The total mileage from Moncton, N.B., to the west side of Water Street, Winnineg, is 1,804.52 miles; this, however, includes the Quebec Bridge across the St. Lawrence, now in course of completion, the length of which is 1.10 miles. Track laying between Moncton and Winnipeg was completed—with the exception of the Quebec Bridge—in November, 1913, the last spike being driven on the 17th of that month. Pending the completion of the Quebec Bridge, communication across the St. Lawrence River is had by means of the train ferry Leonard. The total expenditures on behalf of the Canadian Government up to March 31st, 1916, amount to $156,701,209.65, which sum includes $36,182.91 for operation in the year 1912-1913 of the section from Moncton to Edmunston, N.B.

The Western Division extends from the western boundary of the Winnipeg terminals, on the east bank of the Assiniboine River, in the City of Winnipeg, to the City of Prince Rupert on the Pacific Coast, a distance of 1,745 miles. It is divided into two sections, namely, the Prairie Section, extending from Winnipeg to the east bank of Wolf Creek, a distance of 915 miles, and the Mountain Section, which extends from the east bank of Wolf Creek to Prince Rupert, a distance of 830 miles. The terminals extend for a further distance of 3¼ miles around the water front of the City of Prince Rupert. The position of the work in the Western Division at March 31st, 1916, as deduced from the report of the chief engineer acting for the Government, appears to be as follows:—

"In order to carry out the contract requirements, work to the estimated value of $2,372,500, covering the making up of embankments, ballasting, passenger station and yard at Edmonton, and erection of permanent structures on the first 280 miles west of Winnipeg, still remained to be done at the close of the fiscal year. Work remaining to be done on the Mountain Section includes the filling in of temporary trestles, certain ballasting, roundhouses, machine shops, completion of divisional sections, and further facilities at Prince Rupert terminals." The estimated cost to complete the foregoing, after making certain allowances, was $3,785.270. The approved and certified expenditure up to March 31st, 1916, amounted on the Mountain Section to $93.160.195.76, of which the amount paid to the G.T.P. was $70.769.300.85, including interest. On the Prairie Section no certificate had been issued since October 31st, 1907, the expenditure to that date being $15.556.482.84, of which the percentage payable was $10,335.482.92. The whole division between Winnipeg and Prince Rupert has been operated since September 6th, 1914.

Quebec Bridge Feature of the N.T.R.

On August 29th, 1907, the cantilever bridge across the St. Lawrence River, above the City of Quebec, and forming a connecting link on the National Transcontinental Railway, collapsed. The enterprise of construction was a private

one; however, the Government had provided for the right of assuming the undertaking, which they did on December 1st, 1908. The deed of assignment and transfer from the construction company to the Government was of date October 18th, 1909. A Board of three engineers was constituted to prepare a new design and specification for the reconstruction of the bridge, with power to call in expert advice if necessary.

A design other than that prepared by the engineers was sent in by the St. Lawrence Bridge Co.—with whom were associated the Dominion Bridge Co. and the Canadian Bridge Co., both Canadian enterprises. Same was accepted by the Board of Engineers because of its features of strength, simplification of erection, economical distribution of material, general appearance, etc. The contract price was in the neighborhood of $8,650,000, and completion is expected in the course of the present year, there being only the centre span to put together and lift to place. It is, of course, well known that accomplishment had reached a similar stage a year ago, completion then being frustrated by an unforeseen eventuality which resulted in the centre span being lost in the river.

The bridge will have a total length of 3,228 feet, or about three-fifths of a mile. The centre span is about 1,800 feet long, its suspended portion being around 640 feet. This span will, for a length of 760 feet over the river, have a height of 150 feet between its lower members and high water. The two cantilevers are each 580 feet long, and the width of the bridge between the trusses is 88 feet, comprising a double track railway and two sidewalks for foot passengers.

GRAND TRUNK PACIFIC RAILWAY COMPANY

THIS has already been noted in connection with the National Transcontinental Railway; however, it may not be out of place to give the G. T. P. view of the undertaking. The country through which the Prairie Section of the railway passes contains land now known to be well adapted for the growing of wheat; in other words, it is the great agricultural belt of the Canadian North-West. This land, now being settled, produces rich crops the first year of cultivation. The Mountain Section, passing through the mineral deposits will take a little longer to develop. One of the important questions to be considered was that respecting the gradients which enter so largely into economical operation, hence the selection of the Yellow Head Pass route through the Rockies to the Pacific Coast.

The Mountain Section lies between the 52nd and 57th parallels of latitude, and it is probable that no other area in North America can equal this portion of British Columbia in natural resources. Where there is no agriculture and pasture, there is mining or lumbering to be developed, and where none of these are in evidence, although they often occur in one district, there is at least trapping and hunting. Coincident with the selection of the route through the Rockies to the Pacific Coast was the location of the terminus. The point selected, namely, Prince Rupert, is situated within 50 miles of the Southern extremity of Alaska, and is reached from the Pacific Ocean via Dixon Entrance and Brown Passage. Prince Rupert harbor possesses some of the greatest advantages to ocean shipping that can be found along the whole Pacific Coast. It has a direct channel passage leading into it of more than half a mile in width, and is sufficient in extent to accommodate shipping in large volume and vessels of the biggest tonnage.

Prince Rupert Terminal

The site of Prince Rupert is a picturesque one. The land slopes back gently for distances ranging from half a mile to two or three miles. Here and there the ground rises abruptly, providing the necessary fall for drainage and sewerage, while a shore line five or six miles in extent sweeps around the front of the city. The view from these elevated stations and from the back is a charming one. On the opposite shore mountains slope down to the water. To the northwest, through a channel studded with islands, is situated the famous Indian village of Metlakatla, known on the coast as the "Holy City."

Prince Rupert is situated about 550 miles north of Vancouver. The new Transcontinental Railway will possess the shortest route from Liverpool to Asiatic ports by at least two days' sail, and this saving in distance will also be realized between American Atlantic ports and Trans-Pacific points. It lies in the centre of the salmon fishing industry of British Columbia, being in the immediate vicinity of a large number of canneries which ship their product throughout the world, and here is also to be found off the banks of Queen Charlotte Islands the finest halibut fishing known to exist, tons of which are taken annually to supply Eastern markets. This traffic will be greatly augmented upon the completion of transportation facilities.

Regarding progress at Prince Rupert, plans were prepared and approved by the Grand Trunk Pacific Development Co. and the British Columbia Government (the former having a three-quarter interest) for the first sub-division of two thousand acres of the townsite, and the first sale of lots was held by auction at Vancouver, B.C., May 25th to 29th, 1910 following which, sales were also held at Victoria and Prince Rupert.

Extraordinary interest is manifested in this new Canadian seaport on the Pacific Ocean, as it is destined to very early develop into a large and important centre of industrial and commercial activity, affording exceptional opportunities for the investment of capital, the present development of the townsite itself, apart from expenditures on the construction of the railway, already representing an investment of several millions of dollars.

On June, 1910, the Grand Trunk Pacific Coast Steamship Co. inaugurated a steamship service between Seattle, Victoria, Vancouver and Prince Rupert, placing in commission the palatial twin screw steamers "Prince Rupert" and "Prince George," which had just been completed at the shipyards of Messrs. Swan, Hunter & Wigham Richardson, Ltd., at Newcastle-on-Tyne, England. This, in addition to several other lines of steamers operating between Victoria, Vancouver and Prince Rupert, and points in Alaska, places the new Pacific Coast terminal in an exceptionally accessible position on the lines of the most modern water transportation, pending and following completion of the railway.

WILL DEVELOP CHEMICAL AND DYE INDUSTRIES

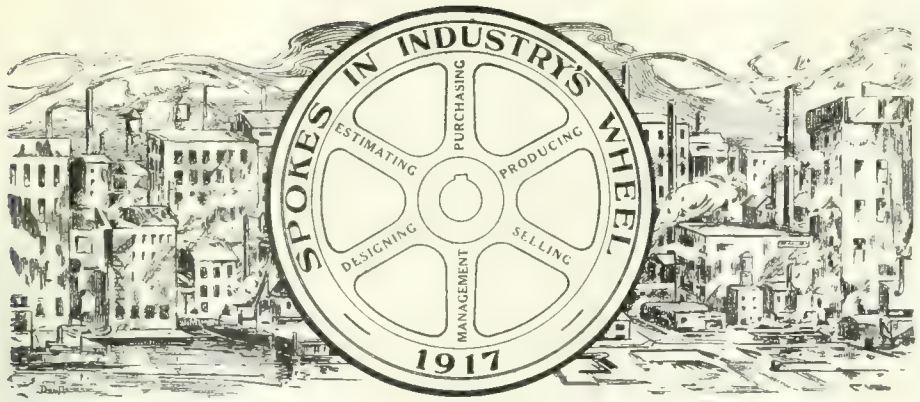
EXPERTS state that it will require almost super-human efforts to establish dyemaking as a Canadian industry, but such a task will eventually be accomplished. The enormous expenditure entailed in the erection of immense plants required for the industry is causing would-be investors to hesitate before making the plunge; but as soon as Canada can provide a market that would warrant the investment the enterprise will be taken up with a view to permanently ousting the German material from the Canadian field.

It is pointed out that chemical industry as a whole is very busy, although prices have risen enormously during the past two years; in some cases over 1,000 per cent. The demand is increasing, but it is very difficult to get supplies. The difficulty confronting the manufacturing chemists is that no business is being done, except for spot lots. The consumers will not trade in futures. Taking it on the whole, the Canadian wholesale chemical business, while active, is virtually on an auction basis.

The war work of the United States has created a shortage for the domestic trade of sulphuric, nitric and other acids used for munitions, and until larger quantities can be produced the price will remain abnormal.

Through the efforts of Canadian chemists, many high explosives are now being made in Canada, and shells can be completed on this side of the Atlantic for use in the war zone. For many months after Canada had gone into the munition business, only the steel and fuse portions of the shells could be made, and the munitions had to be shipped across the border or to Great Britain to be completed.

The efforts of the various chemical interests to permanently establish complete chemical and dye industries in Canada, have resulted in the combination of the interests concerned, who have held meetings to endorse the plan advocated and inaugurate an institution in Canada which will virtually duplicate the work of the Mellon Institute of Chicago. This institute takes up industrial problems and endeavors to solve them in the interests of the industries concerned. The valuable results obtained by this institution has brought up the need of a similar organization in this country.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

WILLIAM RODGER

AT no time in the world's history has the need of engineers of resource and ability been so emphasized as now, when the revolutionary yet enlightening discoveries and applications of science and engineering are all essential factors in the problems of the moment, namely, the development of latent forces that have remained so long dormant, and their utilization. What Canada has achieved during the past three years despite almost overwhelming difficulties and erstwhile obstacles, savors in some degree of the miraculous.

The subject of this sketch, William Rodger, designing and constructing engineer for Fraser Brace & Co., also acting in the same capacity for the St. Maurice Construction Co., both of Montreal, has been one of Canada's industrial "spokes' in the past three years of rolling progress. Born of Scotch parents in the town of Pollokshaws, Renfrewshire, Scotland, a few miles south of the city of Glasgow, the boy secured his early education in the Calder Street Public School at Govanhill, another suburb of Glasgow. At the age of 13, shortly after he completed his public school course, he entered the employ of Messrs. Dubs & Co.. Glasgow Locomotive Works, where he acquired a thorough knowledge in the design and construction of locomotives, serving a seven years apprenticeship, much of the time being spent in the drawing office. During this preparatory course and for some time afterwards. William endeavored to attain those theoretical fundamentals that are essential to success in every branch of engineering practice. During the season of 1893-4, he was a student in the junior mathematical class at the evening classes of the Abbotsford Public School. In September of 1896 he attended Andersons College evening classes, where he obtained a certificate from the Department of Science and Art, South Kensington, in the elementary stage of Applied Mechanics, also one in steam from Professor Rowden. In the Fall of 1904 he attended the Glasgow and West of Scotland Technical College, under Professor Magnus MacLean, completing the term as a certified graduate in the first course of Electrical Engineering. In 1910 he received a certificate for course I in Mathematics, graduating the same year in the advanced

WILLIAM RODGER.

course of Mechanics and Theory of Structures.

At the age of 21, while still working for Dubs & Co., he was entrusted with the designing and draughting of the plans for engines at the works of the Highland Railway, Inverness; these engines being afterwards built by Dubs & Co. In 1898, at the age of 23, he accepted a position as chief draughtsman with Neilson, Reid & Co., Hyde Park Locomotive Works, Glagow. In addition to his drawing room duties, he was occasionally delegated as inspector of materials received and products delivered by the firm. After remaining with this firm for a period of ten years he went into partnership with Rodger & Harris, electrical engineers, but owing to the depression of trade at that time, the business was given up and our "Spoke" accepted a position as engineer with Telford, Grier & Mackay, installing ammonia machines for creameries. From June 1909 until the spring of 1911, he was employed as a steam expert at the Singer Sewing Machine Co. factory at Clyde bank.

On the 6th of April 1911, he left the Land of the Heather to try his fortune in that of the Maple, leaving Liverpool on the Cunard steamer Lusitania and landing in New York on the 13th of the month. The particular date of his arrival in a new land had no superstitious influence on our "Spoke," and after a few days of sight seeing, he resumed his journey to the Canadian Metropolis. The day following his arrival in Montreal, he started work with the Canadian Pacific Railway at their Angus shops as locomotive and later as elevating draughtsman. While in this position he had the privilege of making the plans for the observation cars Laggan and Louise.

The abnormal activities however, that immediately followed the outbreak of the war, provided additional opportunity for our "Spoke" to acquire that wider experience that is often thrust upon us in periods of extremity. With the C. P. R. actively engaged in furthering the best interests of the country, and their ready response to the urgent call for duty, Mr. Rodger was called upon to assist in the design and construction of special hydraulic presses for the manufacture of shells and cartridge cases. In September 1915, he accepted a position with the Dominion Bridge Co. as mechanical draughtsman, and assisted in laying out the plant of the Dominion Copper Products Co. In December of the same year, he was appointed chief of the engineering department of the Jenckes Machine Co. of Sherbrooke, P. Q., continuing with this firm until the spring of this year, when he accepted his present position with Fraser Brace & Co.

Mr. Rodger's wife is a daughter of Joseph Carruthers, a printer of Glasgow, and they with their two children, a son and daughter, reside at 107 Girouard Ave., Notre Dame de Grace. Like all good Scotch folk, they are affiliated with the Presbyterian Church, our "Spoke" having been one of the managers of Fairmount until leaving for Sherbrooke. His travels have been largely confined to business activity, but in 1914 the family paid a visit to the old home, returning during the stormy days of the opening session of the war. He is an Associate Member of the Canadian Society of Civil Engineers, and a member of the Montreal branch of the Canadian Railway Club. He is also affiliated with the A. F. and A. M., being a member of Fairmount Chapter. Both

he and his wife are members of the Eastern Star.

Speaking of his experience, Mr. Rodger says:—"Technical education must go hand in hand with practical experience in order to attain a reasonable degree of success in any vocational calling, and this is particularly true in science and engineering owing to the rapid strides that are continually taking place in these directions. Conscientious study and hard work are the essentials of success, and close application to details and a thorough knowledge of what is doing in other sections of the engineering field will make good engineers of willing students. In order to keep in close touch with general practice it is imperative that the other fellow's point of view should not be allowed to slip past unnoticed. I heartily approve of the reading of technical papers and make it my duty to enlighten those under me to carefully study same."

MACHINISTS' INSTRUCTION COURSE XXIII.

By J. Davies.

IN cutting spirals on a milling machine, the work is usually held between centres. There are two distinct and separate motions imparted to the work. A rotary motion of the head combined with a longitudinal motion of the table. These motions must maintain the same constant relation to each other. The table travels by means of a feed screw. On the end of the feed screw is a gear which is connected by other gears to the index spindle. It is evident that by this arrangement any motion of the feed screw will cause the table to go backwards or forwards and at the same time cause the index spindle to rotate, so that the pitch of the spiral depends entirely upon the ratio these two motions bear to each other.

Calculating Gears for Cutting Spirals

Before attempting to make any calculations there are two indispensable factors which we must find out—(1) The pitch of the feed screw; (2) the number of complete revolutions the worm spindle must make to turn the head, or the work, once round. Obtain this by actual count of the worm spindle connecting the index head, then measure the feed screw, checking up the measurement by making one revolution of same and measuring the advance of the table. If this precaution is not taken the operator may be misled by measuring a thread with two starts or a compound thread.

Having once obtained these figures they will be used in every calculation for the same machine. We will take the figures that are common on most milling machines. Suppose the feed screw is 4 threads to the inch and the worm shaft makes 40 turns to one of the spindle carrying the work, then it is evident that if they were geared together by equal gears, they would each make a revolution in the same time. Since it would take 40 revolutions of worm spindle to revolve the work once, it follows that the feed screw would also make 40 revolutions in the same time, and as the feed screw is ¼ in. pitch, the table would be advanced 40 times ¼, or 10 in. Under these conditions, the spiral that would be cut would have a lead or pitch of 10 in. From this explanation, the following simple universal rule can be deduced. To obtain gears required, multiply lead in inches of spiral to be cut, by the number of threads per inch of the feed screw (in this case 43), and divide by 40. Note that in calculations for the same machines, the same figures are used every time. The 4 represents the number of threads per inch of the feed screw, and the 40 represents the number of turns of worm spindle to turn the work round once.

To prove example just mentioned:—What gears would be required to cut a spiral with a 10-in. lead? Applying rule just given, $10 \times 4 \div 40 = \frac{10 \times 4}{40} = \frac{40}{40}$

Ratio $\frac{1}{1}$ or any equal gears.

Example 2—It is required to cut a spiral having a lead of 2½ in. with a machine having a feed screw 4 thrds. per in. and requiring 40 revolutions of the worm shaft for one turn of the work.

According to rule—Lead of spiral required multiplied by number of threads per inch of feed screw divided by number of revolutions of worm shaft,

$$\frac{2\frac{1}{2} \times 4}{40} \quad \frac{10}{40}$$

and any two gears having this ratio or proportion to each other will do.

Use of Compound Gears

Milling machines are usually made so that compound gears may be used if necessary. For example—It is required to cut a spiral having a lead of 15¾ in.

$$\frac{15\frac{3}{4} \times 4}{40} = \frac{63}{40} \text{ ratio of gears.}$$

Divide into factors $\frac{7 \times 9}{5 \times 8}$ Gears with 7 and 9 teeth would be absurd, so we must raise the value. We can multiply, add, subtract, or divide at will, as long as we are careful to retain the same relative values. Multiplying every figure by $4 = \frac{28 \times 36}{20 \times 32}$

A little consideration is required to find where each gear must be placed. Place the smallest wheel where the most revolutions are required; a moment's thought will show whether this is on the worm shaft or feed shaft.

Sometimes it is impossible to cut the exact spiral required by the gears available; when this is the case, either a special gear must be made, or come as close as you can with the gears you have. Here is a case in point: It is required to cut a spiral with a lead of 11.66 in. $\frac{11.66 \times 4}{40} = \frac{46.64}{40}$. To eliminate fractions multiply by 100 $= \frac{4664}{4000}$. Find all the factors of these two numbers by dividing by the prime numbers, commencing at the lowest—a table of prime numbers was given with the screw-cutting calculations recently.

Factors of 4664 are as follow:

2	4664
2	2332
2	1166
11	583
	53

$= 2 \times 2 \times 2 \times 11 \times 53$

Similarly the factors of 4,000 are $2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5$.

We have, therefore, the following fraction:

$$\frac{2 \times 2 \times 2 \times 11 \times 53}{2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5}$$

Cancelling equal factors top and bottom and leaving an equal number of factors above and below, we have

$$\frac{11 \times 53}{20 \times 25} \text{ or } \frac{22 \times 53}{40 \times 25}$$

If any of these gears should happen to be a prime fraction to its lowest terms, thus $\frac{11 \times 53}{20 \times 25} = \frac{583}{500}$

Multiplying this by the ratio of revs. to thds., we have

$$\frac{583 \times 40}{500 \times 4} = \frac{5830}{500} = 11.66 \text{ pitch of spiral.}$$

Approximating the Wheels

If the actual number of wheels required are not available, by using 3 of the set, and substituting for the fourth one a gear with a tooth, more or less, a very close approximation to the required spiral can be cut. Suppose in the example just given we substitute a 54-gear in place of the 53, what actual spiral would be cut? Proceeding as per rule just stated for proving our calculations,

$$\frac{22 \times 54 \times 10}{40 \times 25 \times 1} = \frac{11880}{1000} = 11.88 \text{ actual spiral cut.}$$

In cutting spirals it is very important to secure the work that it will not slip in any direction, as any slipping of the work would be fatal to a good job, even if the job was not entirely spoiled.

It must be borne in mind when selecting a cutter, that a cutter with straight sides will not cut a spiral groove with straight sides; in fact, no cutter with either one of two straight sides will reproduce its own profile in a spiral groove. For producing a spiral groove with straight sides a specially formed cutter or an end mill is required.

Grinding and Setting Lathe and Planer Cutting Tools

Staff Article

Two of the prime essentials, if not the all-important factors in general machine shop practice, and those that are left entirely to the judgment of the individual operator, more particularly in the smaller shops, are the grinding of the various cutting tools and the setting of same in their respective positions. The efficiency of numerous plants is seriously hampered by the lack of knowledge on the part of many operators of the elementary requirements pertaining to their own work. Lubricating or cutting compounds are undoubtedly a great aid in the removal of metal, but the agents that perform the actual work, should receive every attention before their faults are covered with a flow of cooling fluid.

THE primary object of all steel cutting tools is the removal of metal from castings or forgings, and of necessity they are of much harder material than that of metal upon which they operate. It often supposed that ordinary lathe or planer tools accomplish their purpose by shearing action, but certain factors in the removal of the metal are very similar, the actual conditions are widely different. This is more clearly indicated by referring to Fig. 1. The sketch to the left illustrates the method of shearing metal, the stock being severed by means of two blades, the cutting faces of which are in line with each other. In the ordinary power shear the lower of these two blades is stationary, while the upper travels in a vertical direction; the cutting edge of the blade being set at an angle to the one on the fixed table. In the case of a punch and die, the two cutting edges are often left parallel to each other, but "shear" may be given to one or the other by scolloping the cutting edges. Comparing this shearing of metal to the action of the ordinary cutting tool, as

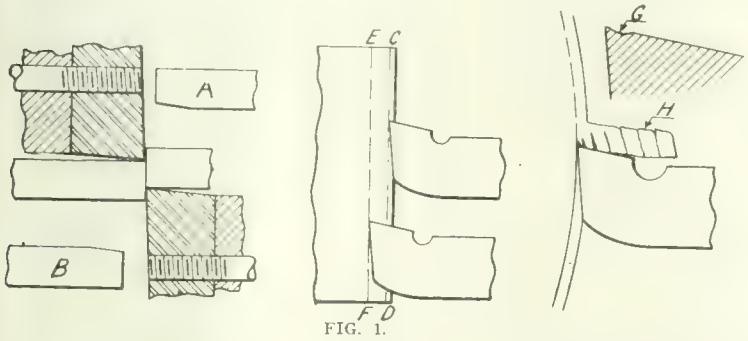


FIG. 1.

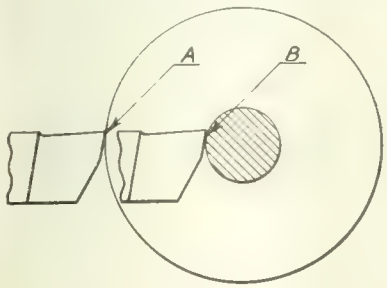


FIG. 3.

used on a lathe or planer, we immediately comprehend the varied conditions.

The center sketch of Fig. 1 shows a lathe tool set to two different depths of cut, which according to the shearing theory could be taken with the same consumption of power, as the shearing resistance is practically the same along the lines C-D and E-F. We know however, that much more power is required to perform the heavier cut. The feature that dispels the shearing idea is the fact that the work itself occupies the position and is supposed to perform the function of the upper shear blade, shown in the left hand sketch. The detail that may be said to relate these two processes, shearing and cutting, is the compression of the material as the cut is being made. When a piece of material has been sheared the ends will have the appearance shown at A and B, where the metal has been squeezed during the initial stages of the cutting process. This "compression" or distortion is continued further in the case of the cutting tool, owing to two main reasons; that of the relatively small cut, and to the fact that the resistance is continuous. Owing however, to the rake that is given to most tools, this metal ,as it is crushed together, is forced to move along the path of least resistance and when the compression reaches a certain point, the chip is severed more by a tearing process than the actual cutting of the metal.

Chip Appearance

To the right of Fig. 1 is seen a lathe tool and the approximate appearance of a chip as it comes from the work. It will be noticed that the chip is much thicker than the depth of the cut, and broken up into small sections. It may often be observed that after a tool has been used for some time, the cutting edge will have an appearance similar to that shown in the exaggerated sketch at G. Fig. 1, the wear being greater at a short distance from the edge, thus demonstrating that the force required to remove the metal is not one of cutting only, but also one of crushing and bending the chip, following the separation of the molecules from each other.

Separation of the Chip

With the exception of the very lightest of cuts it may be reasonably accepted that the extreme edge of the cutting tool does not perform the function of actually "cutting" the metal, as the wedge shape of the tool is the chief feature in the operation. Close observation of a piece of material that has been turned in the lathe or formed in the planer or shaper, will show that the surface is covered with minute but regular sharp projections, resulting from the action of removing the metal. If this had been cut, the surface would have been smooth, but the existing conditions denote that other factors are at work in separating the chip from the body of the material. What does take place is graphically illustrated in Fig. 2, showing the splitting or tearing action caused by the wedge-shaped tool. When the angle of this

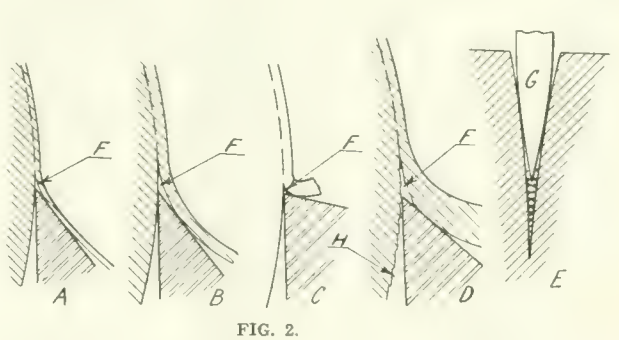


FIG. 2.

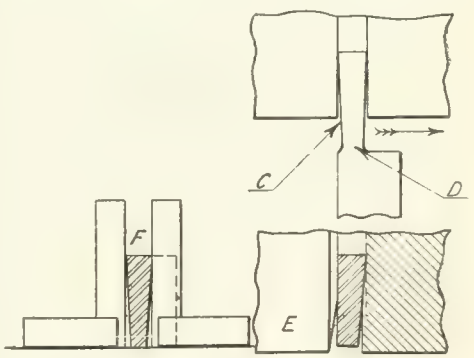


FIG. 4.

wedge is very acute and the chip is light, as shown at A, the process is nearer to a cutting one than when the angle is increased or the chip is heavier. When the chip is thin, the tearing of the metal

extends but a short distance ahead of the tool as the chip bends more freely than that of the heavier cut, as shown at B.

Effective work however, is practically impossible with such an acute angle on the cutting tool, and it is therefore necessary that a suitable angle be used to minimize the objections that are self-evident in those shown at A and B. Whereas the chip in these last two instances remains practically the same thickness as the depth of cut, the chip from the recognized standard tool as shown at C has a different apeparance. As the greater amount of power required to remove the metal is consumed by the tearing apart of the molecules, it has been found advisable to reduce this factor to the lowest minimum. This is accomplished by adopting an angle of rake to best answer all conditions; not the least of these being the heat that is generated during the operation. In addition to the heat that is created by the tearing of the metal, the friction of the chip upon the surface of the tool and also that within the chip, caused by the continual crushing and distortion of the severed metal, results in a rapid heating of the tool, and if excessive rake is used on the tool the point will quickly be destroyed by the abnormal rise in temperature. To aid in the dissemination of this heat, lubricants or cutting compounds are in general use which materially assist the functions of the tools in the efficient removal of the metal; this feature will however, be dealt with at a future time. An exaggerated condition of the ragged surface resulting from the tearing away of the chip is shown at D in Fig. 2, and the direction of these saw-tooth serrations is opposite to what might be supposed, inasmuch as the teeth point toward the cutting tool instead of the other way. This can be easily demonstrated by passing the hand over the work after a cut has been taken.

The scientific grinding of metal cutting tools is receiving increased attention from various plant executives, more particularly among the larger manufacturers where this problem can be effectively handled owing to the greater number of tools employed. The universal tool grinders that are now on the market have done much to not only attain but maintain an efficiency that would be impossible under the old order of things, for by the use of these it is possible to establish a system of tool grinding that cannot be materially effected by the varied ability and lack of knowledge on the part of the different workmen. Where these grinders are installed, it is possible to place the maintenance of all tools in the hands of an experienced operator, so that the work will always be accomplished under the same or relatively the same conditions; the setting of the tools by the individual machine operators being the only factor that will subsequently affect the general efficiency of the tool. This latter feature is however, one of the essentials of machine shop practice that cannot very well be placed owing to the varying characteristics and ability of those who are employed to operate the various classes of machines.

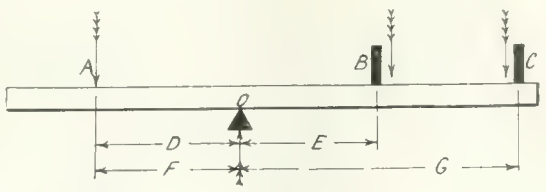


FIG. 6.

To assist or try to assist those who do not have the advantage of a special grinding machine or fixture, the full page chart accompanying this article has been prepared, to show the purpose of the different tools, and the rake and various clearance angles that are best suited for general conditions, it being almost impossible to compile data to cover specific cases; these having to be considered according to the work in hand and the particular nature of the tools used.

Taking a tool to the grinding wheel and putting an edge on it may seem a simple matter, but it may be truly said that the usefulness of tools is very often destroyed by hurried or careless grinding. It is not sufficient to put an edge on the tool but this must be done in such a way that the cutting efficiency will still be retained. Many an operator, in his anxiety to get back to his work, will rush the grinding process to such a point that the tool will be unduly heated with the possibility that its cutting qualities will be destroyed by the drawing of the temper; this is more likely when a dry wheel is used. Another feature of hasty grinding is often shown by the gradual disappearance of the rake or clearance, or possibly both, caused by the hurry to get on "edge" and neglecting the more important factors which perform the greater portion of the work.

In the use of the wet wheel, the general overheating of a tool is not so pronounced, but is none the less likely to be partly ruined by careless manipulation. Excessive pressure causes the tool to heat rapidly, this heat being partly disseminated by the flow of the cooling fluid, but the extreme cutting edge heats and cools so rapidly that minute cracks often develop along the edge, these being invisible to the naked eye but when used again on the work will result in the edge crumbling away, thus destroying the effectiveness of the tool. This

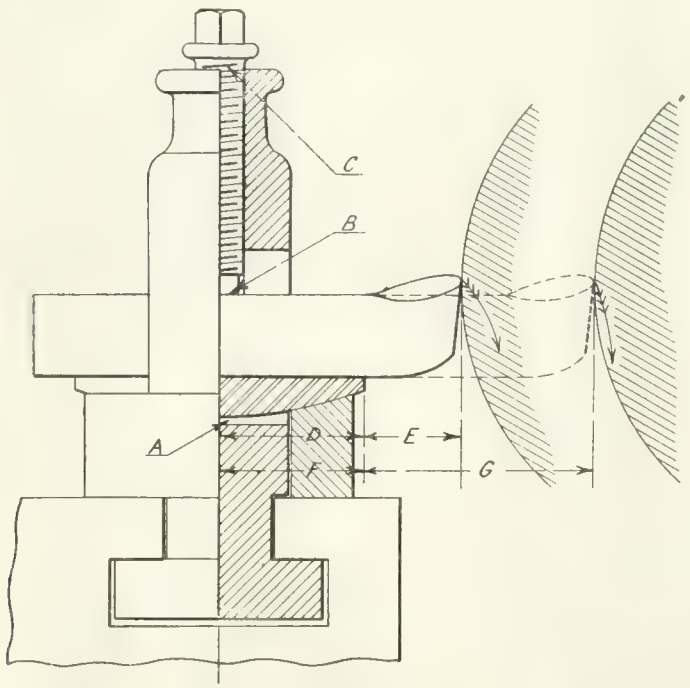


FIG. 5

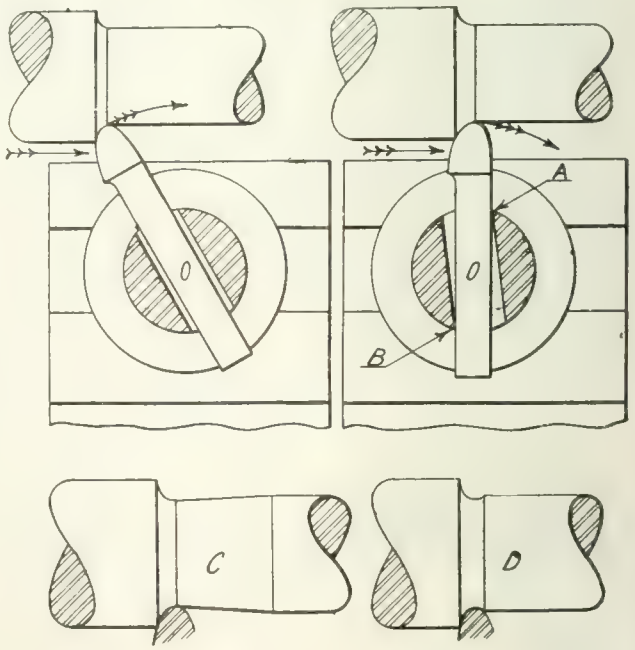


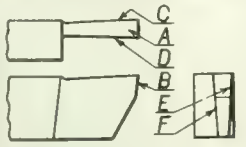
FIG. 7.

TOOL GRINDING CHART

CLEARANCE AND RAKE ANGLES FOR VARIOUS CUTTING TOOLS.

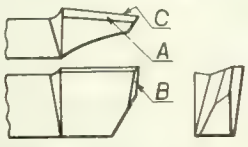
SMALL STRAIGHT ARROWS INDICATE THE DIRECTION OF RAKE ON FACES 'A'.
CURVED ARROWS SHOW POSSIBLE PATH OF CUTTING POINT UNDER PRESSURE.
CENTER COLUMN ILLUSTRATES A FEW SUGGESTIONS FOR SETTING TOOLS.
DISTANCE 'H' SHOULD BE SHORT AS POSSIBLE TO AVOID SPRING AND CHATTER.

1. PARTING

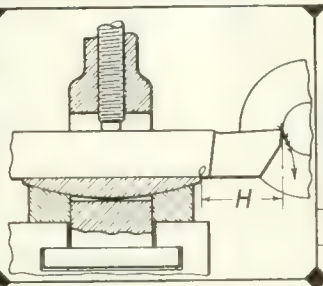


FACE	A	B	C	D	E	F
ANG.	2°	6°	2°	2°	3°	3°

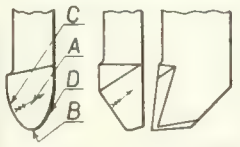
2. FACING



FACE	A	B	C
ANG.	12°	6°	6°

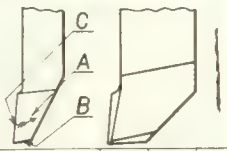


1. ROUGHING



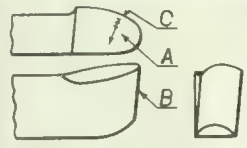
FACE	A	B	C	D
ANG.	12°	4°	6°	C°

2. CORNER



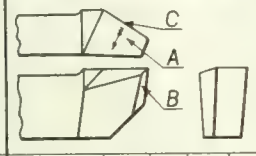
FACE	A	B	C
ANG.	10°	4°	6°

3. ROUGHING

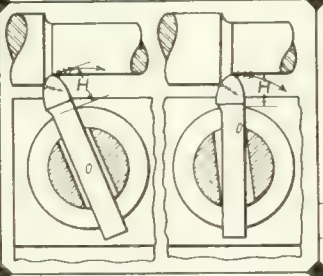


FACE	A	B	C
ANG.	22°	6°	6°

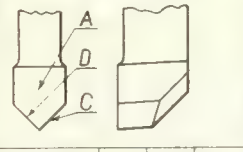
4. ROUGHING



FACE	A	B	C
ANG.	22°	6°	6°

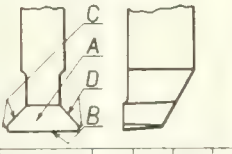


3. CHAMFER



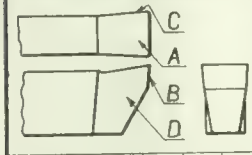
FACE	A	B	C
ANG.	0°	4°	4°

4. 45°-SLOT



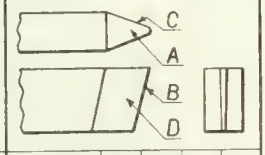
FACE	A	B	C	D
ANG.	0°	4°	4°	4°

5. FINISHING

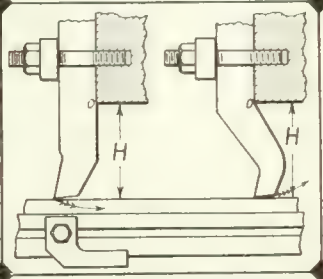


FACE	A	B	C	D
ANG.	10°	6°	3°	3°

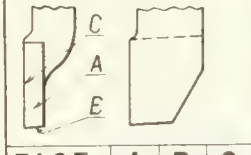
6. BRASS



FACE	A	B	C	D
ANG.	0°	10°	8°	8°

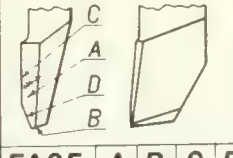


5. VERTICAL



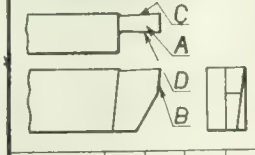
FACE	A	B	C
ANG.	0°	4°	6°

6. SIDE FIN.



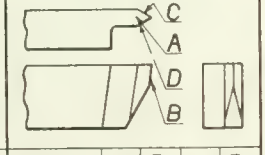
FACE	A	B	C	D
ANG.	18°	6°	6°	4°

7. SQ.-THREAD

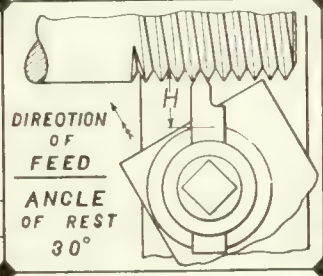


FACE	A	B	C	D
ANG.	2°	6°	10°	0°

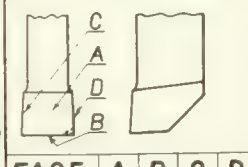
8. V-THREAD



FACE	A	B	C	D
ANG.	0°	15°	12°	6°

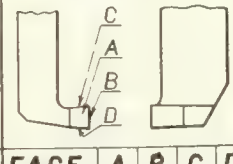


7. FINISHING



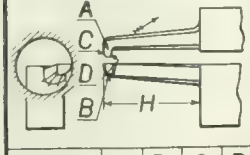
FACE	A	B	C	D
ANG.	7°	4°	3°	3°

8. SIDE SLOT



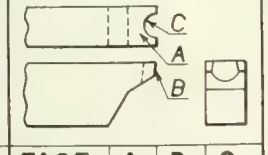
FACE	A	B	C	D
ANG.	6°	4°	3°	3°

9. BORING

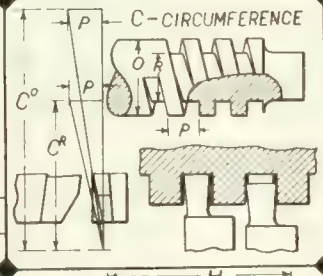


FACE	A	B	C	D
ANG.	5°	8°	6°	6°

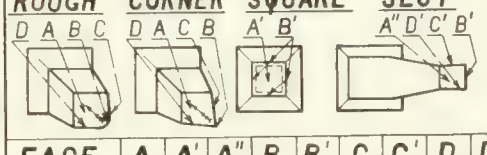
10. BEADING



FACE	A	B	C
ANG.	0°	6°	6°

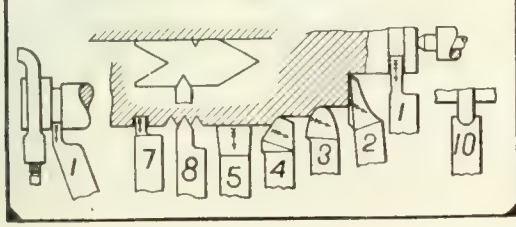


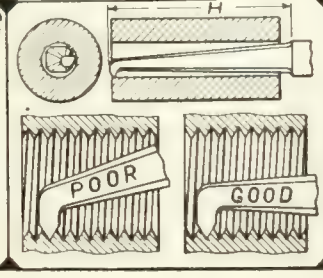
9. SLOTTING TOOLS



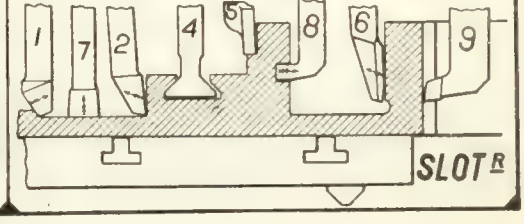
FACE	A	A'	A"	B	B'	C	C'	D	D'
ANG.	8°	0°	6°	6°	4°	4°	3°	4°	3°

SETTING LATHE TOOLS





SETTING PLANER TOOLS



objectionable feature of grinding edge tools is further emphasized if the wheel does not cut freely and undue pressure is required to accomplish the desired purpose.

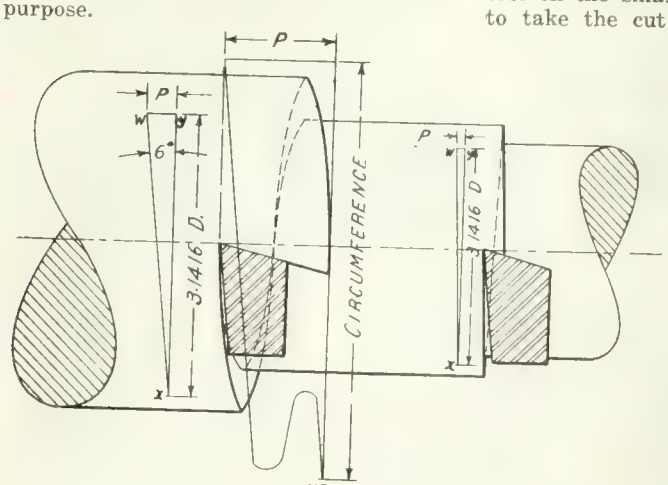


FIG. 8.

Correct Setting Necessary

Accurate grinding of tools may be considered to be one of the essential factors in the metal cutting problem, but the efficiency of good grinding may come to naught if it is not followed by experienced judgment on the part of those who set the tools for the actual performance of the work. Even the scientific grinding to recognized shapes by an expert tool grinder will not compensate for the destruction of the tool through faulty setting of same. In the hands of a novice the setting of the tools may be of much greater importance than careful grinding. Generally speaking, the cutting edge of all tools on lathes should be in the same horizontal plane as the axis of the spindle, or at the same vertical height as the centers upon which the work revolves. This however, can be modified to suit certain conditions, but the rule must be strictly adhered to on work where the tool is operating at different diameters during the same cut; this holding good for all classes of work with the exception of parallel shafts or cylinders. The foregoing can be clearly shown by referring to Fig. 3, which illustrates an ordinary parting tool in the operation of cutting off a shaft. If the edge is placed somewhat above the center as shown at A, the cutting will be entirely satisfactory but, as the tool approaches the center, the clearance of the tool disappears owing to the smaller diameter, thus showing the necessity of keeping the tool on the center line and maintaining a uniform angle of clearance. With the edge above the center, an unobserving or careless workman would have the disposition to "force" the tool on the smaller diameter, causing it to take the cut in jumps, which often destroys the alignment of the shaft or results in the breaking off of the portion being cut.

A parting tool may have every appearance of being correctly ground with the cutting edge on the centre, and yet be of little use for effective work if the side clearance (or lack of it) interferes with the operation of the cut, as shown in Fig. 4. After the tool has been ground, it should show the same clearance on either side of the cutting blade, as illustrated at F; but it should also be seen to that this clearance is maintained after the tool is placed in the holder. For various reasons the tool may acquire a tilt that would eliminate the clearance, with the result that the tool would be forced to one side as it was advanced into the work. With the tool tipped as shown at E, a side thrust would be put upon the tool in the direction of the arrow and, with the saddle fixed, the tool would in all probability rupture at the point D as the weakest section of the tool.

Effect of Overhang

Apart from the actual cutting of the metal there are several incidents in connection with the setting of lathe tools that materially affect the efficiency of the tool being used. Rigidity and stability are undoubtedly the two factors upon which the successful operation of an accurately ground and properly set tool depends. To insure this condition it is at once realized that the cutting point should be as close to the support as circumstances will permit, and therefore the overhang H should be as short as possible. Fig. 5 is a sketch of an ordinary single post tool holder, showing two positions of the tool and illustrating the effect of overhang. The curved arrows indicate the path of the cutting point under the pressure of the cut, the fulcrum being at the point O as shown in the full page chart. The ordinary cutting tool is simply a beam fixed at one end, but is subjected to bending pressure in two directions, that of the downward pressure of the cut and the side thrust caused by the feed along the work.

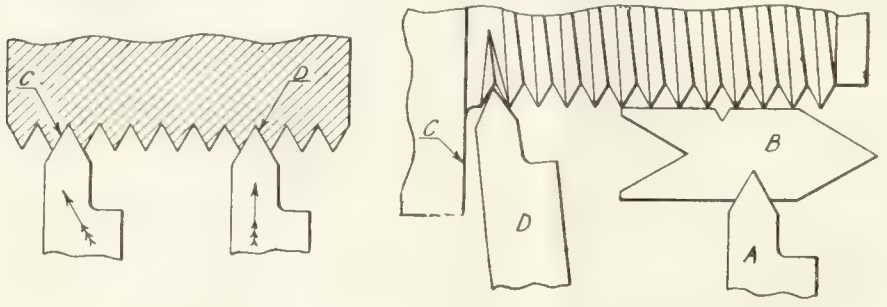


FIG. 9.

Fig. 6 is a diagram illustrating the downward action of the cut; O represents the fulcrum or extreme outer support of the tool, the point A being the center of the tool-post screw, and B and C two different positions of the cutting edge. With a tool pressure of 500 lbs. at the point B, and the length E equal to 2 inches, the bending moment about the point O would be 1000 inch lbs., with a similar cut at a distance of G or 4 inches, the bending moment will be 2000 inch lbs. It is therefore obvious that it requires much heavier tools to withstand the same cut at greater distances from the main support, as the holding power in each case is virtually unchanged.

Tool Post Features

There are in the make up of lathe tool-posts, several small details that require careful and constant attention in order that the best work can be performed by the tools. One of these is the space that is necessary below the tilting gib to permit of clamping the tool in position. When the machine is working on cast iron, the cuttings will often accumulate about the post and pack tightly in this space and if not removed will prevent effective clamping of the tool. Another feature that has the same effect is when too short a screw is used in the post, or when an extra shallow tool is used, causing the screw to tighten at the shoulder, before sufficient pressure is exerted on the tool. Still another point that interferes with the clamping facilities is the absence of occasional lubrication on the threads of the screw, especially on the lower end, oil being necessary to reduce the tendency of the screw to seize and thus prevent the required pressure on the tool. It would seem from the position of the curved arrows that any "digging in" would be greater on the shorter than on the longer tool, and while this is true on the diagram, the increased rigidity of the shorter position almost eliminates the tendency to dig in that is so pronounced on the tool with the greater overhang.

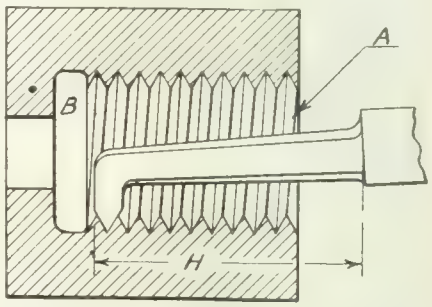


FIG. 10.

Theoretically the longitudinal position of a cutting tool should be at right angles to the line of travel, but this rule is seldom if ever strictly adhered to.

For ordinary work where an average cut is taken, the position of the tool would be as shown to the left of Fig. 7, but as the thrust of the cut acts in the direction of the straight arrow, any movement of the tool under excess pressure would cause the cutting point to travel in the path indicated by the curved arrow, the center of the movement being at the point O or the axis of the tool-post screw. The result of such a possibility would have one of two effects; that shown at C being caused by the gradual change of position, and that at D by the rapid slipping of the tool under the increasing pressure.

During the past two years, many shells have been spoiled from this cause, generally through the tool suddenly losing its cutting edge from encountering an exceptionally hard spot in the body of the forging. Where there is a tendency for the tool to act in this way it should be held in the position illustrated at the right of Fig. 7 so that any side movement of the tool will cause the point to travel away from the work as indicated by the curved arrow. To assist in preventing slippage of the tool it is sometimes advisable to tighten the screw when the post is in the position shown with the side bearing against the points A and B, this method increasing the stability of the tool.

Cutting Clearance

Under normal conditions, the clearance on the advancing side of the tool is about six degrees, but under certain circumstances it might be found necessary to alter this angle. With a heavy feed it might be thought that this angle would require to be increased, but a study of Fig. 8 will make it clear that for ordinary turning the standard angle is sufficient. This can be exemplified by simple calculation. On a shaft 4 inches in diameter, the circumference will be 12.5 inches nearly, and the sine of an angle of 6 degrees for this length will be approximately 1⅜ inches. This will therefore be the required lead or pitch of the feed to entirely eliminate the angle of clearance, and it is quite obvious that such a cut is very improbable. To the right of Fig. 8 is shown a three inch shaft with a tool set for a ¼ inch cut. To determine the angle of advance, we divide the pitch (or feed) by the circumference to find the sine of the angle: thus .25 divided by 3 × 3.1416 equals .0265, and the corresponding angle is approximately 1½ degrees. Therefore the actual clearance when the tool is cutting is 6 minus 1.5 equals 4.5 degrees.

Thread Cutting Tools

In the ordinary turning tools, the actual profile of the cutting edge is not a very important factor and may be modified to suit specific conditions, but in thread-cutting tools it is essential that the profile, or cutting edges, should conform to accurate shape and dimensions, as regards the angle of the V thread or the width of the square or special thread tools. When grinding a V, or U. S. S. thread tool, special care should be exercised in obtaining the correct angle, and after getting it, to use equal precaution in setting it in the tool holder. As accurate threads can

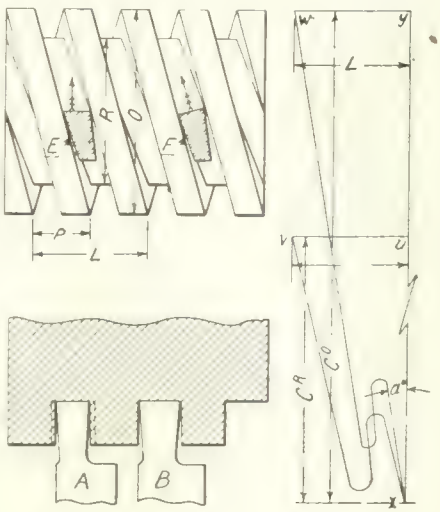


FIG. 11.

only be derived from the cutting of them, it is imperative that the tools and the ability of the operator to correctly set and manipulate them, are the two chief factors in the successful performance of this class of work.

Where dies are the medium for cutting threads, the semi-automatic operation of the machine partly eliminates the responsiblities of the workman, but when threads are cut with the single point tool on the engine lathe, the achievement of good work depends entirely upon the judgment and ability of the operator, not alone in the grinding and setting of the tools and the actual cutting of the thread, but also upon the condition in which the lathe is kept. Maximum stability together with freely operating mechanisms, are essentials in the accomplishment of accurate and rapid production.

In addition to such factors that are more or less common to the average workman, there are very often small kinds or incidentals, insignificant in themselves and known only to individual mechanics, that tend to facilitate the cutting of the thread. In general practice it is customary to grind the top of the tool flat so that the surface will be horizontal, or parallel to the axis of the lathe spindle. This is theoretically correct, but, in the cutting of coarse pitch threads, the angle of advance is a factor that should be reckoned with for more satisfactory operation. When the top surface is horizontal, it must be evident that each side of the tool is working under contrary conditions, owing to the difference of "rake" upon the tool; this is more pronounced on the coarse pitch screws. It might appear that with a horizontal face no rake existed, but a little observation will show that positive rake exists on the advancing side, and negative rake on the opposite or trailing side of the tool. By grinding the face at right angles to the neutral angle of advance, both cutting edges of the tool will operate under practically the same conditions. Grinding the top face from the horizontal, however, slightly affects the accuracy of the thread shape. Unless the pitch is excessive, this variation makes very little difference and, where exceptional conditions are involved, special considerations are required.

Cutting V Threads

In the cutting of V threads, or those that require the tool to be operating on the both edges at the same time, the action of the chip is a feature to be contended with, as the two chips curling from opposite directions have the tendency to affect the free cutting of the tool, and this with the additional heat that is generated by the friction of the chips, often results in the destruction of the sharp point of the tool, owing to its inability to disseminate the increased temperature. When the tool is fed directly into the work, or in other words, at right angles to the axis of the spindle, this possibility is ever present, and in order to avoid this contingency and at the same time materially assist the cutting operation, it is often advisable to swing the compound rest (where such is provided) around, so that the tool will do all or most of the cutting on one edge.

As shown in the left view of Fig. 9 the direction of cross feed travel is indicated by the arrow, and it is obvious that the tool at D must cut on both sides as each cut is taken. On the other hand, if the rest is swung around to an

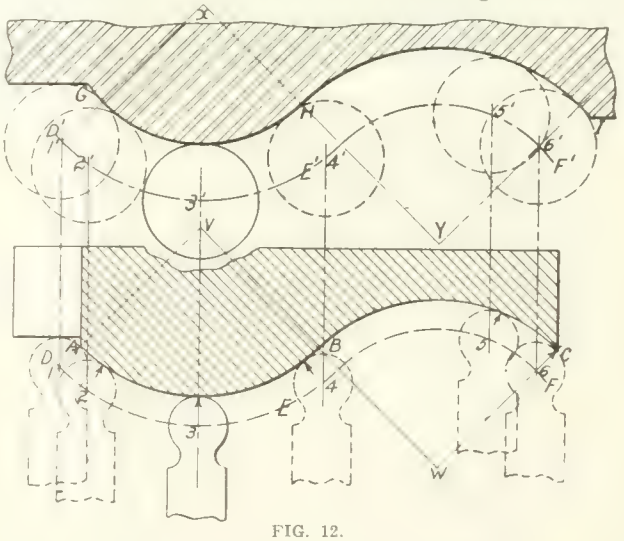


FIG. 12.

angle of 30 degrees, it is also clear that only the advancing side C will do the cutting, provided the depth of cut is made by the compound rest screw. With this method of setting and feeding the tool, it is possible to retain a horizontal upper face, thus retaining the accuracy

of the tool shape and at the same time have the desired rake for increased cutting efficiency.

Under these conditions, with the tool cutting only on the one side, the chips do not have the same tendency to jam that is so pronounced in the direct inward feed. It is also possible to alternate the cutting from one side to the other, by first feeding with the compound slide and then with the lower or fixed cross slide. After grinding the tool to the correct angle, its effectiveness should not be destroyed by careless setting. Broadly speaking, the cutting edge should be set on the horizontal line for reasons before mentioned, and in such a position that the inclination of either side will be relatively the same. This should be accomplished by using the regulation or other suitable gauge as illustrated at B in the right hand sketch of Fig. 9. After setting the tool it should not be knocked to one side to allow for clearance of shoulders on the work or interference with the drivers or rest. If the tool, as first set, will not clear for all positions of the thread, it should be reground to suit the conditions or replaced by another. If a tool is set as shown at D, in Fig. 9 at right, be it ever so slight, it must be evident that a correct thread is impossible.

Internal Thread Tools

Practically the same conditions apply to the cutting of internal as those for external threads. Wherever possible a recess should be cut at the inner extremity of the thread to permit of free cutting. When this is not permissible, the first cut should be allowed to go the limit of depth and at each succeeding cut the tool should be backed off a little earlier that the one immediately preceding it. The extension of the tool that enters the opening should be as heavy as circumstances will permit, and the overall length of this portion H, should be as short as possible, to insure stability and maximum rigidity under the pressure of the cut.

Owing to the increased difficulties of cutting internal threads, greater care is required in grinding the tool, not as regards the accuracy of the angle but in its relation to the part that enters the hole. After the tool is set for proper thread alignment, it should be run in clear of the bored hole, to the farther end, and then carefully observed that no interference takes place at any point. It sometimes happens that in setting the tool, insufficient space is allowed at the point A, Fig. 10, and when the tool is cutting at the inner end, or when being freed from the cut, it will rub against the work and destroy the threads at the mouth of the hole.

Square Thread Tools

The conditions that apply to V threads may also be considered as those that govern the production of square or special threads. For all ordinary purposes, the forward or advancing clearance on square thread cutting tools is taken as 10 degrees, but this angle must be altered to meet special conditions. This angle may be determined by dividing the pitch of single threads (or the lead of multiple threads), by the circumference of the shaft upon which the thread is being cut. The result will be the sine of the desired angle, and by looking up a table of trigonometric functions, the corresponding angle will be obtained. The angle may be derived graphically by laying off the lead and the circumference at right angles to each other and connecting the two extremities. It will be quite evident that the angle of advance at the root of the thread will be considerably greater than that at the outer or larger diameter, but as the front clearance angle of the cutting tool counteracts the root angle of the thread, it is sufficient to strike a fair mean between the two angles obtained, if anything, favoring the greater angle. It is advisable, more particularly on the heavier threads, to use two tools for completing the work, one slightly narrower than the finished dimension, and the other for finishing the thread to the correct width. This not only facilitates the cutting operation but insures increased uniformity throughout the length and also greater accuracy.

A feature that is additionally emphasized in the cutting of square threads is the action of the chip as it curls from the tool. Referring to Fig. 11, if the top surface is ground with a horizontal face, as that shown to the left, it will cause the chip to curl in a vertical direction, and the chip will rub against the back or training side of the groove, creating a tendency for the chip or small detached particles to be forced between the tool and the work, and resulting in irregular cutting of the tool. By noticing the appearance of the tool, with reference to the cutting edge on the front face, it is very apparent that the cutting rake varies for every section of its width, being greatest at the advancing side and least at the trailing corner. By grinding the top face as shown to the right, the rake will be equal at all points, and the chip will curl upwards at right angle to the groove in which it is travelling, thus eliminating the tendency of the cuttings to jam by excessive friction on the trailing side. This latter method, however, will, owing to the angle that the front face makes with the axis of the shaft, have the effect of producing a slightly concave surface at the bottom of the groove, this, however, being so insignificant as to be entirely overlooked, and may be afterwards removed if necessary. It is the inability of the chips to pass freely from the tools that often makes the cutting of threads so difficult to many workmen.

Tools for Irregular Work

As previously mentioned all tools other than those for parallel work should be set with their cutting edges on the center line, at the same horizontal height as the centers upon which the work revolves. This is particularly true of tapering work or irregular pieces developed from the action of a cam. In Fig. 12 is illustrated, as a typical example, a section of an irregular piece, the shape of which is derived from the movement of a roller in contact with a cam at the rear of the lathe. Several points must be considered in connection with the production of work of this description, and where large quantities are being made, it is imperative that the closest attention be given to the various details in order to maintain a uniform product. As no variation can be made in the profile of the work, it is necessary to operate from this as a base in order to calculate the shape or size of the tool, the contour of the cam, and also the size of the roller in contact with the cam.

With very few exceptions, the cutting tool will travel at right angles to the axis of the work as it operates on the constantly changing diameter, and it is quite obvious that at no time during the entire length will the tool be cutting under the same conditions. As the tool travels laterally, the neutral point at which the tool is cutting, as indicated by the small arrow heads, will continually change, and for this reason it is always advisable to have a circular shaped tool to eliminate the possibility of error by faulty grinding.

Circular Tools

The adoption of circular tools assists in developing and subsequently maintaining the accuracy of the cam from which the work is produced. For the developing cam to be the same shape as that of the finished work, it is necessary that the cutting tool be of circular form and of the same diameter as the roller in contact with the cam. If a point is used, it is essential that a similar point be on the cutting tool but this latter method has many objections. The neutral path of travel is the all-important factor in work of this nature. In the diagram Fig. 12 the line D E F should correspond with that of the line D^1 E^1 F^1, the profile of the cam being developed from this latter line. It must always be borne in mind that the centers of the tool and the cam roller should be in the same relative position to the contours of the work and the cam. If the profile forms an arc of a circle and is developed by using a radius arm, the length of the arm must equal the radius of the arc plus that of the cutting tool, and the center of the tool must lie on the produced center line of the radius arm, when the same is at right angles to the axis of the work.

The full page chart accompanying this article has been made, as far as possible, self explanatory so that it can be used for reference purposes. The various angles at which the different faces are to be ground cannot possibly cover all classes of work, and those indicated will require to be modified to suit special circumstances, but for all general conditions the angles given are approximately correct for mild steel and cast iron. With few exceptions, the suggestions for the grinding and setting of lathe tools, also apply to shaper and planer tools.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

USING WORN AND OUT-OF-DATE TOOLS

By J. Edwin.

ONE often sees tools, especially machinist tools, that have been in constant use for, say, ten, twenty, thirty years, or even longer, and the claim is generally made by the owner that they are just as good or even better than those made to-day. It does not require a very close scrutiny of these tools to see that as well as being far out-of-date, they are worn, nicked, and fit only for the "discard."

Among this class of tools the writer has seen a bevel-protractor having no graduation of degrees on it, bearing the stamp of the year 1864, same having been put on by the owner when he bought it. A four-inch scale is seen still in use stamped with the figures "1875." The four corners of the scale are rounded off, the graduation marks are nearly worn away; therefore, for accurate measuring purposes it is about as useful as a strip of sheet iron. A casual inventory of worn-out and broken tools used by workmen will reveal a considerable number having such defects as warrants their disuse. Included in these are monkey-wrenches with broken handles or handles gone entirely; the adjusting screw with a worn thread and shaky, the knurled end worn smooth; hammers with the flat sides broken off, the handles wired, or partly missing; try-squares nicked, and out of true; pliers and hand-vises which slip and will not take hold; flexible scales broken in two, and numerous other kinds that possibly have come to the reader's attention.

The reason why such tools are still kept and used is because of the associations attached to them; a matter of sentiment. Their use is unprofitable and expensive, because too much care and manipulation are required in operating them. It matters little in how good a condition an old tool might be, for accuracy and convenience it can never compare with those of up-to-date manufacture. Besides, the means for producing first-class working and accurate measuring tools is quite different and more highly specialized than was the case, say, ten to forty or fifty years ago.

Take, for instance, the present type of micrometer, it has in addition to the barrel adjustment, a rachet adjustment, and a binding screw which holds the stem when set, thus eliminating all possibility of its moving after the correct adjustment has been made. Heat treatment of tools is better understood than it used to be. This, of course, is casting no reflection on the old school of mechanics, for many of them were highly skilled, even more so than a great many of our workmen of to-day; but modern machine shop practice, coupled with experience and new ideas, has made possible, by means of special gauges, grinding fixtures, etc., the production of tools that do not vary in the slightest degree of accuracy.

There is little excuse for workmen to continue to use old or out-of-date tools, because the class of the latter that can be bought now are not only moderate-priced, but they contain many useful and improved attachments which makes them still more valuable. It should be as much a rule with mechanics to throw away their old tools as it is of manufacturers to scrap their old machines and replace them with machines of more modern design.

TURRET LATHE PRODUCTION ON AN ENGINE LATHE

By D. H.

THE castings of which a section is shown in Fig. 1, were wanted for some equipment in a munition plant. Being for hydraulic work, the best of iron and workmanship were required. The foundry

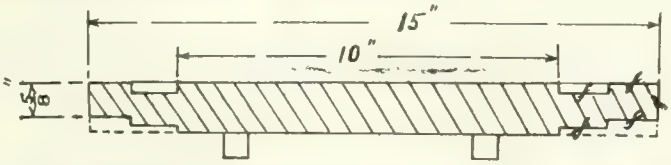


FIG. 1. TURRET LATHE PRODUCTION ON ENGINE LATHE—SECTION OF CASTING.

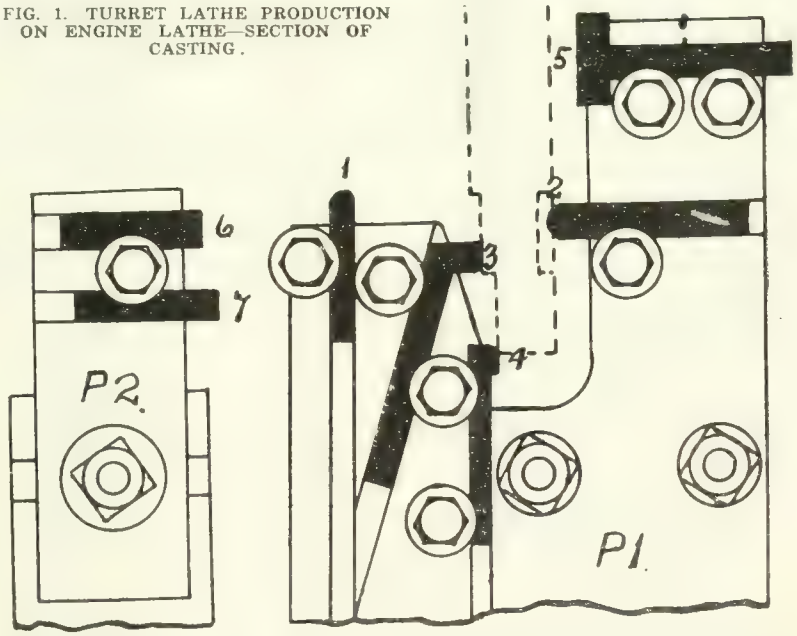


FIG. 2. TURRET LATHE PRODUCTION ON ENGINE LATHE—TOOL LAYOUT.

which took the job could make the iron all right, but had no apparent way to machine them at competitive prices. One hundred and twenty pieces were wanted, all faces to be machined at one setting.

Tool Layout

After some scheming the tool layout shown by Fig. 2 was evolved and the work was done with it in a 20 in. engine lathe. An iron plate P, 1, was cast, 1½ in. thick, and bolted to the cross slide in place of the tool post. This plate carried five tools, bolted in slots in the upper surface. These tools did all the cutting except the finishing on the chuck side of the castings. Tool 1 turned the outside diameter, tools 3 and 4 roughed the steps on the back, and tool 2 turned the front side. In using the cross-feed, tool 2 began the cut, closely followed by tool 3, making a parallel cut on the back; these two were not directly opposite and when it was time to move tool 3 away to form the step, tool 2 was in position to rough out the depressed ring on the front. After the roughing out, tool 5 was brought up and squared out both corners of the depression.

The back of the casting was left flat as shown by the dotted lines. Actual working proved the wisdom of this; neither of the back tools encountered any sand such as would have been unavoidable if the steps had been cast, the back tool 3 acted as a balancing cut for tool 2 and prevented springing the disc, and having plenty of metal to remove the back tool was not dulled by "skating" over the scale on possible low spots.

Machining the Back

To give a better finish on the back and to square out the corners, two tools, 6 and 7, were mounted in a plate P2, on

a slide rest bolted to the carriage. This slide rest was the familiar auxiliary one with independent hand feed.

The tools used were all high speed tipped, the tips being ⅛ in. x ⅜ in. discards from inserted blade milling cutters. They were brazed to C.D.S. shanks. They averaged three grindings for the job.

Stops were set on the cross slide to gauge the diameters; also stops were used for thickness. A piece of tool steel was milled for a lathe hand's gauge, giving him in one piece a thickness gauge, a depth of slot gauge, a width of slot gauge, and a gauge for the step. This was the only tool he had.

Quick chucking and positive driving were essential. A three-jaw universal chuck was used. Three chucking lugs for this were cast on the back. One of these had an extension that served as a driver. It thus took very little time to set up each piece. Afterwards a few blows with a hammer cracked off the lugs.

A satisfactory time was realized. Including all tools, packing boxes, sharpening of tools, and setting up of the job there was spent an average of fifty-nine minutes on each casting. This included the last of four castings in getting ready.

CAST IRON MILLING CUTTERS

By D. A. Hampson.

IN A pump shop not far from New York City, there are large milling cutters in use, which are made entirely of cast iron. Experiments by the tool room foreman produced the present type which is made by turning up a blank and cutting the teeth just as if it were tool steel. This blank is heated to a red heat, and plunged in a bath of hydrochloric acid. It is then ground as any cutter, but a minimum amount is taken off; provision is made to keep the discs straight in hardening and this materially helps—if too much is ground off the teeth are softer. The cutters are not wonders, but are sufficiently good to be used in place of the 12 in. and 14 in. inserted blade cutters at present steel prices.

Cast iron milling cutters have been used before. Some years ago a railroad shop in the Northwest was making them for their own use. These were hardened by some case-hardening process they had developed and were made in sizes down to 6 in. in diameter.

HYDAULIC AIR COMPRESSOR FOR TIRE SERVICE, ETC.

By C. Mills

THE accompanying sketches illustrate a simple device to inflate automobile or bicycle tires without the usual manual labor. It is cheaply constructed and very serviceable. The tank is an ordinary 30 gal. water service tank using water at city pressure—60 to 70 lbs.—to displace the air, which is taken away by a small pipe at the top and connected to the tire by a small hose. The tank illustrated in Fig. 1 has been found large enough for tires up to 32 x 3½ in., one filling of water being sufficient for two completely deflated tires or four semi-deflated.

To inflate tire, connect hose coupling

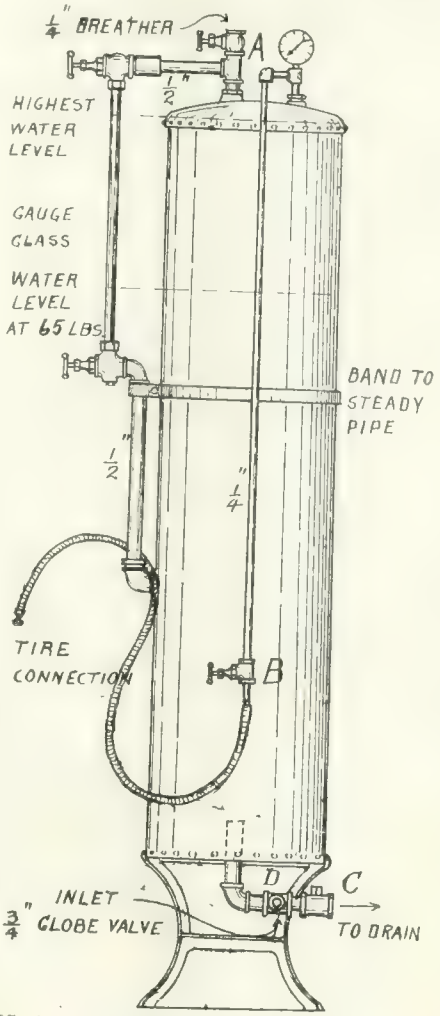


FIG. 1. HYDRAULIC AIR COMPRESSOR FOR TIRE SERVICE, ETC.

to valve stem, close the valves A and C, and open D. The air pressure will rise till it is equal to the water pressure.

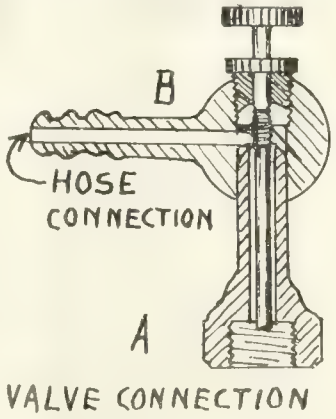


FIG. 2. HYDRAULIC AIR COMPRESSOR FOR TIRE SERVICE, ETC.

When the necessary pressure is acquired, close valve D. Air can be used until the water in gauge glass shows at high level marks, which is about 1 or 1½ in. from top head of tank. Beyond this level, water is liable to get into the air pipe and into the tire. To drain tank, open valves A and C. When empty, it is ready for another charge.

The pressure in the tire will be somewhat less than that in the tank, caused by the tension of the small valve spring in valve stem of tire. If full tank pressure is required, it is necessary to use a small fitting like Fig. 2, which is easily made. It is composed of the usual coupling A soldered into a brass fitting B. A small threaded stem passing down through a stuffing box engages the valve stem, forcing it down from its seat. When inflating tire, turn the small screw two or three turns down after the coupling is connected on valve stem, when tire is full, loosen back the screw before taking off the coupling.

STEAM TENDERS FOR LOCOMOTIVES

THE development of the Mallet locomotive to its enormous dimensions on American railways has resulted in the "triplex" engine having three groups of driving wheels, the rear groups being under the tender. A more recent and more peculiar arrangement is the application of power to tenders for engines of more ordinary type and size. To increase the power of new goods engines of the 2—8—2 type the Southern Railway has taken discarded engines of the 2—6—0 and 2—8—0 types, removed their boilers and placed large tanks or tender bodies on the frames. The cylinders of the tender are reduced to a smaller diameter than those of the engine, and the steaming capacity of the boiler is improved by means of fire-brick arches, while a feed-water heater is added to utilize the exhaust from the air-brake compressor pump. Well-lagged pipes convey either superheated or saturated steam to the tender cylinders.

The 2—8—0 tender increases the drawbar pull of the engine by nearly 40 per cent. The engine has cylinders 27 in. by 30 in., and 63 in. driving wheels, with 51,600 lb. tractive power. The cylinders are bushed to 27 in. by 26 in., giving a tractive effort of 48,000 lb. The 2—8—0 tender with cylinders 20 in. by 24 in., and 50 in. driving wheels has a tractive effort of 28.500 lbs., making a total of 76,500 lbs. The weight of the steam tender is about 85 tons. It carries 8,000 gallons of water. The engine weighs 135 tons with 107 tons on the drivers. On a division seventy miles long, with gradients of 1 in 66 and 1 in 59, the 2—8—2 engines alone can take trains of 1,100 tons on the heavy gradients and 1,150 tons elsewhere. The "duplex" engines—with steam tenders—can take 1,400 tons and 1,600 tons, and increase of 27 and 39 per cent., respecticely.—*The Engineer.*

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CANADA'S RAILROAD DEVELOPMENT

IN our present issue, and by way of supplementing the articles which appeared a week ago covering the Confederation Jubilee of the Dominion of Canada, there is featured, at some length, the development that has taken place in railroading within our borders. Through the courtesy of the various railway executives, we are able to bring to the attention of our readers a number of facts concerning this phase of our national advancement, and through the medium of the illustrations which accompany the article, give them a more vivid realization of the extent and value of the achievement compassed.

It is, of course, generally believed that as far as the construction of transcontinental lines is concerned, we have been more enterprising than wise, in other words, we are provided with facilities very much ahead of their profitable employment. As a result, how best to minimize, if not altogether eliminate the undesirable tendencies arising from the meantime superabundance of across-country transportation, is a question second only in importance, but lacking nothing in magnitude, comparatively, to our part in the prosecution of the war in Europe. The financial side of our railroading is the disturbing factor, and this, of course, is no new thing, as in the early period of our Confederation history, and probably antedating even that, revenue did fall materially short of expectation, and not only so, but short of the existing need. Steps have been taken towards the best possible solution of the problem with which we are meantime menaced, and we are hopeful, having regard to the procedure adopted, and the apparent desire to have highly skilled minds do the work involved, that at no distant date the irksomeness of the situation will be very materially relieved.

The cessation of emigration from the Motherland and Europe generally, as a result of the war, has retarded settlement to a very great extent, hence in some degree the non-fulfillment of anticipations of transportation revenues. Again, in view of the long drawn-out nature of the conflict in Europe, with its life and territory devastating accompaniments, there may well be misgivings as to the number of settlers who may come to our shores in the next decade, or even quarter century. It is of interest to note, however, judging from recent statistics, that large numbers from across the line have taken advantage of the opportunities we have to offer, and perhaps the most satisfactory feature of such a circumstance is to be found in that the influx shows a well-balanced distribution, between the objectives of cultivation of the land, and the establishment of manufacturing plants.

On account of the severity of our winters, we are almost wholly dependent on our railroads for many months; in addition we have to requisition their services unstintingly all the time. The war, while non-hurtful as regards business offering, but rather the reverse, has exercised its influence to the detriment of our railroads in other directions. We refer particularly to the lack and high price of materials entering into road construction and betterment, rolling stock repair and efficiency maintenance. Steel, that primary essential, not only to railroads, but to every conceivable form of industrial enterprise, is not only high-priced, but scarce, and is likely to remain so while the war lasts. Not only are our own steel mills devoting their whole attention to the production of munitions steel, or that to serve a kindred end, but those of the United States from which we have been wont to at least supplement our requirements, are likewise so concentrated.

Much heart-burning has been in evidence with regard to the apparent failure of our railroads to measure up to the needs of the hour, not only with regard to the transportation of much needed munitions and general manufacturing equipment, but to that of maintaining a sufficient fuel supply for daily and coming winter needs. We are of opinion that not only are all the circumstances fully appreciated by our railroad executives, but their efforts are concentrated to overcome the "hard spots." It is impossible to do otherwise than credit the various administrations with as much common-sense as is to be found in the conduct of any other line of business, no matter its nature. No business enterprise can boast of an unblemished record of achievement, and none ever will, it may be added, although not a few still measure up to a comparatively low standard. It may be said of our railroads that their efficiency rating will not suffer by any comparison with industrial enterprise generally.

MONEY A FACTOR IN OUR BUSINESS OUTLOOK

THE money situation, present and prospective, continues an important factor in relation to the business outlook in Canada. However, it is not likely that money shortage will seriously affect the general prosperity of the country, although it may necessitate some changes and adjustments in order that available capital be employed to the best advantage, especially as the American market is becoming more difficult to negotiate for new funds, and may be later closed altogether.

Fundamentally Canada is an agricultural country, and with good crops at the prevailing high prices for foodstuffs, and with war demand for manufactured products, moderate prosperity is assured. That is at least so long as we manage our internal affairs in manner to successfully reach the waiting markets with our natural and manufactured profits. Ruling prices insure the required margin of profit, but it is very important that we should have smoothly working transportation facilities. It is vitally important that we should move products and raw materials in such a manner as to secure quick turnover.

In this connection the car shortage has a direct bearing upon the business situation. The more rapidly that crops or manufactured goods reach their market the more quickly will the capital which they represent be raised for other undertakings. Canada must make delivery—at least to the seaboard—to get the benefit of her production. The more rapid the movement, the greater the amount of business which can be negotiated with the country's available funds.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	82 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	50 00

	Montreal	Toronto
Hamilton	....	....
Victoria		.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25

F.O.B., Toronto Warehouse.

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points Per 100 lbs.

	C.L.	L.C.L.
Montreal	23.1	31 5
St. John, N.B.	35.1	45 5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22 1
Windsor	18.9	22 1
Winnipeg	64 9	85 1

METALS.

	Montreal	Toronto
Lake copper	$37 50	$37 00
Electro copper	37 50	37 00
Castings, copper	36 50	36 00
Tin	63 00	66 00
Spelter	12 00	12 00
Lead	14 25	14 25
Antimony	25 00	26 00
Aluminum	70 00	68 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$10 00	$11 00
Heads	10 30	11 30
Tank plates, 3-16 in.	10 10	11 10

WROUGHT PIPE.

Effective May 14, 1917.

Standard Buttweld.

Size.	Black (Per 100 feet)	Galvanized
⅛ in.	$ 4 50	$ 6 00
¼ in.	4 96	7 00
⅜ in.	4 96	7 00
½ in.	6 29	7 86
¾ in.	7 94	10 06
1 in.	11 73	14 88
1¼ in.	15 87	20 13
1½ in.	18 98	24 06
2 in.	25 53	32 38
2½ in.	40 95	51 77
3 in.	53 55	67 70
3½ in.	66 24	83 26
4 in.	78 48	98 65

Standard Lapweld.

Size.	Black	Galvanized
2 in.	28 49	34 97
2½ in.	42 71	52 94
3 in.	55 85	69 23
3½ in.	68 08	86 02
4 in.	80 66	101 90
4½ in.	93 98	118 70
5 in.	109 50	138 40
6 in.	142 10	179 50
7 in.	185 60	232 05
8 L in.	195 00	243 75
8 in.	224 60	280 80
9 in.	269 10	336 38
10 L in.	249 60	312 00
10 in.	321 40	401 70

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 50%.

4½" and larger, 45%.

4" and under, running thread, 30%.

Standard couplings, 4" and under, 40%.

4½" and larger, 20%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$22 00	$22 00
Copper, crucible	26 00	27 00
Copper, heavy	26 00	26 50
Copper wire	26 00	26 50
No. 1 machine composition	22 50	22 00
New brass clippings	18 00	19 00
No. 1 brass turnings	16 00	16 00
Heavy melting steel	20 00	17 00
Steel turnings	9 00	8 00
Shell turnings	12 00	12 00
Boiler plate	15 00	10 50
Axles, wrought iron	23 00	24 00
Rails	19 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	17 00	9 00
Scrap zinc	8 00	9 50
Heavy lead	11 50	10 75
Tea lead	7 50	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	25
Stove bolts	55
Plate washers	net list
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 10
Structural rivets, as above.	7 00
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts .... add 40,	10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		6 50
Spikes, ¼ and 5-16 in.		7 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	13 87
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 62½
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Plumbers' oakum, per cwt.	9 00
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Lead wool, per lb.	0 15
Pure Manila rope	0 37
Transmission rope, Manila	0 43
Drilling cables, Manila	0 39

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks .... list plus	30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 10%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, Black, No. 28	$10 00	$10 00
Sheets, Black, No. 10	9 50	10 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	9 75	9 75
Queen's Head, 28 B. W.G.	10 75	10 75
Fleur-de-Lis, 28 B.W. G.	10 75	10 75
Gorbal's Best, No. 28	10 25	10 25
Colborne Crown, No. 28	10 00	10 00
Premier, No. 28 U.S.	10 90	11 70
Premier, 10¾ oz.	11 10	12 00

PROOF COIL CHAIN.

B

¼ in.	$10 75
5-16 in.	10 40
⅜ in.	10 25
7-16 in.	10 00
½ in.	9 90
9-16 in.	9 90
⅝ in.	9 75
¾ in.	9 50
⅞ in.	9 40
1 inch	9 25
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	55
Kearney & Foot, Arcade	55
J. Barton Smith, Eagle	55
McClelland, Globe	55
Whitman & Barnes	55
Black Diamond	45
Delta Files	40, 5
Nicholson	45
Globe	55
Vulcan	55
Disston	55

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke.	..
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	38
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	6 15
Lard oil, per gal.	1 50
Union thread cutting oil antiseptic	68
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER SHEETS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	2 50
Polishing wheels, bullneck	1 35
Emery in kegs, American	06
Pumice, ground	04
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE decline in prices of soft coal in the United States, ranging from $1 to $1.50 a ton will benefit Canadian consumers, and it is to be hoped that prices of anthracite will also be reduced. The steel market is as strong as ever, and further advances in prices are looked for in the near future. Steel prices are almost getting beyond the reach of the average consumer, and private enterprises are in many cases being restricted. The shortage of steel is also a serious factor and one that will become more acute owing to the increasing demand for war purposes. Domestic pig-irons are still off the market and it is impossible to say when the situation will improve. The furnaces are sold up for the whole of this year with a growing demand for next year's output. Pig-iron prices continue to advance in the United States and the market is very strong. Connellsville coke is also advancing, but supplies are moving forward from the ovens in better volume. The scrap metal market continues dull and featureless, with consumers holding off in expectation of lower prices. Indications, however, point to a firmer market. Prices of non-ferrous metals are holding firm on the basis of last week's quotations; business, however, continues dull, as the trade is still awaiting developments regarding the American Government requirements. The situation in the machine tool market continues unchanged, but general advances are looked for.

Montreal, Que., June 30, 1917.—Industrial conditions in all quarters reflect the pressure that still characterizes every phase of activity. The American situation is clearing but a certain degree of uncertainty marks the developments that are now coming to a climax. Steel conditions have been a little quieter during the week and advances have been less pronounced, but no marked relief has been noted regarding the acute situation in connection with the delivery of all kinds of material.

Pig Iron

Activity in pig iron is still the feature of the iron and steel market with quotations higher on certain grades. The Pittsburgh price on basic pig has again advanced, the quotation this week being $55.95 per ton, an increase on the week of $2 per ton. The demand for low phosphorus pig has never been equalled and as high as $92 is now being paid for this particular grade. Canadian conditions are becoming more acute with producers out of the market and no quotations available.

Steel

With a few notable exceptions the entire situation has taken on a quiet tone and price changes that have been a continual feature for several weeks past, in nearly all lines of product, are this week confined to bars and shapes and also higher quotations for plates; this latter being no surprise in view of the abnormal conditions prevailing in the shipping industry. Every effort is being put forth to facilitate the increased production of steel plates but there appears no possibility of attaining the proportions that are at present required to meet the enormous consumption. The abnormal needs could be still further increased if there was any likelihood of obtaining the material; even the exorbitant prices being a secondary consideration to that of securing the steel. Conditions in the States are still of such a nature as to keep the trade undecided as to what course the government will adopt in connection with the regulation of the prices to be paid for steel and other requirements. What effect the action of the government will have on early future conditions, is as yet, too early to predict, but it is not thought that any great revision will result owing to the heavy demands and constant inquiries from all quarters and for all classes of materials. Mills are still turning down orders for future positions as their books are filled

up in many instances to the end of 1918. The local district continues to suffer owing to the inability to get satisfactory delivery of material; dealers here are closely watching American developments for a lead in future transactions, but the situation is practically unchanged from that of the previous week. All prices are firm with an undertone of increasing strength in plates. Further advances on American quotations would eventually be reflected in local prices. The United States market has had a quiet week respecting price changes; the only ones noted being in steel bars and tank plates, the former on an advance of $5 per ton is now quoted on a base of 4¾c per pound Pittsburgh. The quotation on tank plates has been advanced another $20 per ton, the base price, Pittsburgh, has been advanced another $20 per ton, the base price, Pittsburgh, being 10c flat.

Metals

The general metal situation still carries a burden of uncertainty owing to the delayed action of the American Government in relation to the regulation of price conditions. The nearer approach to a decision in this matter has added to the nervousness that has characterized the market for the past several weeks. The announcement that a price of 25c is to be paid, has done much to clear the atmosphere, but even this price is indefinite as no settled agreement has yet been made between the producers and the government, the price to be later decided after a commission has investigated the present cost of production. Open market prices on copper continue firm. Disturbing factors have made tin weaker. Lead, spelter and antimony are also easier.

Copper.—The American Government has at last decided to fix a price of 25c for their copper requirements; this however with the understanding that the price is subject to the finding of a commission who have been appointed to investigate the present cost of producing copper. This phase of a very uncertain situation has materially relieved the tension of the past few weeks but owing to the indefinite nature of the proposals the market conditions retain a certain degree of nervousness, which will only be finally lifted by the recommendation of the investigating committee. No changes are reported on the New York market, and quotations here remain firm and unchanged; 37½c for lake and electro, and 36½c for castings.

Tin.—The developments of the past few months gradually leading up to the probable control of industrial markets in the States by the Federal government, has created a situation that has culminated in what at present appears to be a disorganized condition in all circles. This is due more to the uncertainty of the government's attitude than to any material unsetting of actual conditions. In face of delayed cables and a falling off of the domestic demand the American market has taken on an easier tone and prices have declined 1¼c on the week, the spot price being now 62¼c per lb. On a quieter market local dealers continue to quote 63c per lb.

Spelter.—The attitude of producers in refraining from accepting orders for future positions, together with the fact that consumers are also holding off, has affected the market to such an extent that weakness has developed with a slight decline in price quotations. New York markets is ¼c lower than a week ago. Local price is unchanged at 12c per lb., market rather quiet.

Lead.—The lull that has come upon the lead market has brought to light considerable metal which may go far to allay the fears of consumers that there was a pronounced shortage of this metal. The range of prices between the leading interests and the independents has again been decreased, the outside quotation being now 11½c, a decline of ½c during the week. The market locally has been steady but this week's quotation of 14¼c is a decline of ½c per lb.

Antimony. — Increased buying has somewhat revived the interest in this metal but the demands for future requirements are very light, and the supplies are much larger than the market can dispose of. The market is easier on the New York quotations but dealers here continue to quote last week's price of 25c per lb.

Machine Tools and Supplies

No important developments have taken place in this branch of industrial activity and conditions continue to reflect the stress that is so pronounced in other directions. Sales are light in munitions machinery but very encouraging in respect to general demand, particularly in connection with equipment for shipbuilding and accessory purposes. The American situation has increased the difficulty of obtaining delivery from firms in the states, owing to the adnormal demand for machines for various purposes. The supply situation maintains its normal condition with prices on all commodities very firm or stronger; a feature that is likely to mark this market for an indefinite period.

Scrap

Dullness has apparently affected the old metal situation, and the waiting attitude seems to be more pronounced than last week. As the time draws nearer for definite action on the part of the American authorities, the nervousness is increasing. These factors are having an influencing effect upon dealers and consumers, and sales are quiet. Local dealers report a strong market with an uncertain undertone.

Toronto, Ont., July 3.—That the trade of Canada continues to expand is shown in the statement recently issued at Ottawa by the Department of Customs. For the month of June the revenue amounted to $15,386,678, compared with $12,030,451 for June, 1916, being an increase of $3,536,226. For the first three months of the present fiscal year the increase in revenue amounted to $11,248,798 over the corresponding period of last year. These figures are very satisfactory in view of the conditions prevailing in regard to shortage and increasing high cost of raw materials and scarcity of labor. A reduction in the price of soft coal ranging from $1 to $1.50 per ton in the United States is welcome news, and will benefit consumers in this section of this country. It is not known as yet if anthracite will be affected, but it apepars likely. The important thing now is to get coal moving in sufficient quantities to fully supply the demand.

Steel

Conditions in the market in the U. S. dominate the situation in Canada to a greater extent than at any other period. Canadian mills, by reason of their heavy commitments of steel for war purposes, can only take care of their domestic business to a small extent; the balance must of necessity, as far as possible, be obtained from the States. In that market, however, conditions are such that domestic consumers there cannot obtain a fraction of the steel they require and private enterprise has fallen off in proportion. Canadian consumers are affected in a like manner, and they are suffering serious inconvenience. Not only is the shortage of steel getting more acute, but prices of many products are becoming almost prohibitive for the average manufacturer, whose only hope is to continue in business as long as his old contracts for steel will carry him, and then await a readjustment.

Although there are no price changes to announce this week, a number of advances are in prospect. Iron and steel bars and structural shapes are expected to advance very shortly. Higher prices on wrought pipe are also looked for. The situation in plates is tighter than ever, and higher prices are inevitable. The plate mills are being taxed to the limit to meet the requirements of the American Government and private shipbuilders. Prices of plates are entirely nominal, and no one can tell what the market is. Conditions in the boiler tube trade are unchanged, and prices continue very firm.

The sheet market continues steady, with prices practically nominal. The commercial demand for sheets continues active, but the mills are refusing to quote on new business not coming from regular customers, conserving as much of their output of sheets of all grades for Government needs. The U. S. Government are ordering sheets at the rate of 19,000 tons monthly.

It is expected that the American Government will shortly announce a decision with regard to contract prices for iron and steel products. In the meantime, prices are advancing, due largely to Government orders, with the result that private consumers are holding off from the market wherever possible.

Pig Iron

Domestic foundry pig irons continue off the market, and the situation is generally unchanged. Pig iron prices in the States, however, are still advancing. At Buffalo, No. 1 foundry, malleable and basic, are now held at $53 to $55. Lake Superior charcoal iron is now $57, Chi-

cago. The coke situation continues to grow serious. Producers are not willing to enter upon contracts at any price, as they say they cannot tell what their production costs will be, nor whether they can secure a sufficient number of cars to make deliveries. Connellsville coke has recently been sold as high as $15.50 ovens, and further advances are expected shortly.

Scrap

The situation in the scrap market is unchanged, and prices are at the same level as quoted last week. Consumers continue to keep out of the market in the expectation of lower prices. Heavy melting steel and machinery cast iron are in good demand and prices are holding firm. Shell turnings are in good supply, and stocks on hand are increasing with a consequent weakening in price. There is a continued scarcity of most old materials which is tending to keep prices up.

Machine Tools

Fair demand for machine tools for general purposes continues to be the feature of market. Prices of practically all lines of tools are very firm, with prospects of advances. In the Chicago district, advances of 5 to 15 per cent. have been made on almost all kinds of machine tools. Radial drills have alvanced 15 per cent., and boring mills 10 per cent. There is increasing activity in the market in the States, which will affect deliveries of machinery imported into Canada.

Supplies

Business continues active at firm prices, but there are no changes of particular importance to note this week.

Metals

The metal markets have been more or less inactive during the week, as consumers and producers are awaiting further developments in regard to the American Government buying. Last week the Government purchased a quantity of lead at 8c, St. Louis, while more recently it was announced that 60,000,000 pounds of copper had been purchased at 25c, New York. A decision in regard to the other metals has yet to be made, which introduces an element of uncertainty into the market. There are no price changes to note this week, but quotations generally are holding firm.

Copper.—The purchase of sixty million pounds of copper at 25c by the American Government has created considerable interest in the market, and it is believed to be an indication that the Government consumption for its own use and also that of the Allies is going to be exceptionally heavy. The market is quiet and prices continue more or less nominal for all positions. Lake and electrolytic are quoted at 37c, and castings 36c per pound.

Tin.—The market is dull and featureless, but prices are holding firm. Local quotation, 66c per pound.

Spelter.—The market continues dull, with a continued lack of interest taken in spelter by consumers. It is expected that further U. S. Government orders for spelter will be at prices probably better than were fixed for the previous purchase. Local quotations unchanged at 12c per pound.

Lead.—The tone of the market is easier, and the independents have dropped their price to 11.50c New York, which is now only a shade above the "Trust" quotation. Local quotations unchanged at 14¼c per pound.

Antimony.—Dullness continues to prevail in the market, and prices are unchanged at 26c per pound.

Aluminum.—The market is quiet and demand light, with quotations unchanged at 68c per pound.

Pittsburgh, Pa., June 30.—Buyers of steel are asking each other the question what is to become of the steel market as there is no check to the flight in prices. Long ago they passed the level at which business could be comfortably done, and now they are, to most consumers, altogether prohibitive. Almost throughout this price movement, which began January 1, 1915, there has been the thought that possibly the market would break, as it seemed to be advancing beyond levels that could be maintained, but each time those who expected lower prices have been disappointed. It is surprising how little confidence some buyers have in a decline, and how they halt on the question of whether to buy or not to buy, even though they can see no possibility of securing such prices for their finished wares as would justify their paying the prices for rolled steel now asked.

Of course there are many buyers who have simply dropped out of the market entirely, realizing that there is less danger in not buying than in buying, and thus the market has been made narrower and narrower week by week, in point of tonnage. There seems always to be greater restriction in the offerings than in the demand and thus prices tend to advance more and more. Blue annealed sheets are quotable at 8c to 9c, or half a cent a pound more than the quotation named a week ago, while black sheets, although quotable generally at 8c to 9c, are nearer the higher figure than the lower. Galvanized sheets are quoted all the way from 10.25c to 10.75c for delivery late in the year, depending on tonnage and the standing of the buyer. Tank plate is now quoted at 9c to 10c, or a cent a pound more than a week ago, ship plates being in the neighborhood of 12c.

An Absurd Market

The market is absurd not only in the height it has reached but also in the great disparity now existing between prices quoted as the market on fresh purchases, and prices at which steel is now being delivered. On an average the current market is about double the average invoice price of the steel being shipped. In plates and sheets the divergence is still greater. Probably nearly all of the early contracting in sheets for the present half year was at 3.25c to 3.75c. In the case of plates it is quite certain that the average price on the deliveries now being made by the larger mills is under three cents, or less than one-third the present quoted market. The smaller mills, which do not contract ahead, are, of course, receiving higher prices on their current shipment. The great disparity between market prices and prices on actual shipments makes it particularly difficult for any manufacturer of finished wares, who is not protected, to do business, because the market for the products he sells has not correspondingly advanced.

Government Regulation

The opinion has been spreading rapidly in the past fortnight that there will soon be some form of Government regulation of steel prices. While the steel manufacturers as a rule say nothing on this subject or if they talk simply refer to the difficult or "impossibility" of the Government fixing a schedule of prices on commodities showing such a wide range in size, quality, etc. A few, however, frankly state that they expect Government price regulation to be forced. If such a thing borders on the impossible, so is the present steel market impossible, as rewards the conduct of any regular and orderly business. It is only the buyer placed in exceptional circumtsances who can afford to pay the prices now asked by the few mills that will quote at all

The opinion that there will be Government price regulation in the iron and steel industry has been strengthened by the regulation of coal prices, which was agreed to Thursday, June 28, to become effective July 1. The price for the Pittsburgh coal district is $3 for slack and mine-run, per net tone at mine, this price being net to operators, brokerage up to 25 cents being allowed.

The case of iron and steel, however, is totally different from that of coal. There were few contracts made for the twelvemonth beginning April, 1, 1917, and most of the coal movement has either been by actual transactions in the spot market, or by shippers having an understanding whereby they shipped customers at a certain rate, the price being adjusted week by week at the spot market or a shade under. Thus the coal industry starts under the new regime with very little contract tonnage on its books, and the adjustment is easy. The blast furnaces and steel mills, on the other hand, have a great deal of tonnage on books and are behindhand in deliveries. If prices were fixed at much below the present market many contracts would have to be revised. The producers would have nothing to sell for some time to come, and there would be confusion in deliveries. Undoubtedly it would be necessary for deliveries on existing contracts to be regulated also.

Pig Iron and Scrap

ThePittsburgh scrap market has experienced a little break in the past week, and this is attributed to the dealers, fearing that there will soon be such Government regulation of finished steel prices as will reduce scrap values. The pig iron market presents the appearance of continuing to advance, but the advances are not well marked in all districts and the disposition to buy is certainly reduced. As illustrative of the nervous condition of buyers, there was a rumor in New England two or three days ago that the Government

was going to reduce pig iron to $30 a ton. The source could not be identified and the rumor certainly was not authentic, but it caused many of the buyers to question sales agents, seeking further information.

New York, June 30.—Machinery interests throughout the United States are overwhelmed with business. The capacity of the manufacturing plants is sold for six months to a year ahead and deliveries are from seven to eight months in arrears, in not a few instances. To meet the pressure many machine toolmakers and founders are extending plants by building additional shops. The demand at the moment is heaviest for fabricating shop equipment. The new orders come mainly from ship builders who have already secured contracts for cargo boats from the Government. War munition manufacturers are actively in the market and liberal contracts have already been placed by builders of airplanes and motors. Additional order for machine tools are sure to follow the completion of the Government's plans for the enormous fleet of airplanes. It is proposed to appropriate $600,000,000 for this purpose.

Manufacturers of machine tools have again advanced prices from 5% to 15%. Prices of lathes have been advanced 12½% to 15%; planers 10%, and radial drills 15%. The demand is especially active for heavy forging machinery. Boring mills have been advanced 10%, and quite often orders cannot be filled at any price. The inability of builders of machine tools to make early deliveries has compelled many manufacturers to seek for second-hand tools, but dealers find unusual difficulty in obtaining these.

The United States Government has just awarded contracts for several 330-ton electric cranes. These will be the largest of the type that have ever been built, and are to be installed at various navy yards. The Navy Department is also actively buying machine tools to equip the many new plants on the Atlantic coast for which contracts have been let. The Government is also on the point of closing for six 6-ton Heroult electric furnaces as it is claimed that only the high grade steel necessary for special projectiles can be manufactured in this type of furnace.

Private ship yards holding Government contracts have placed substantial orders for travelling and locomotive electric cranes. Manufacturers of ordnance, power and steel companies, are also installing cranes and placing new contracts, although in some cases deliveries cannot be made inside of seven months.

Automobile truck manufacturers in need of radial drills, planers and lathes, are not deterred from placing orders by the sharp advance in prices. Liberal orders for shop equipment are also being placed by automobile manufacturers who have turned to building aeroplane motors and engines. Railroads, after being out of the market for a time, are now actively placing orders for shop equipment, and

(Continued on page 72)

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address. Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

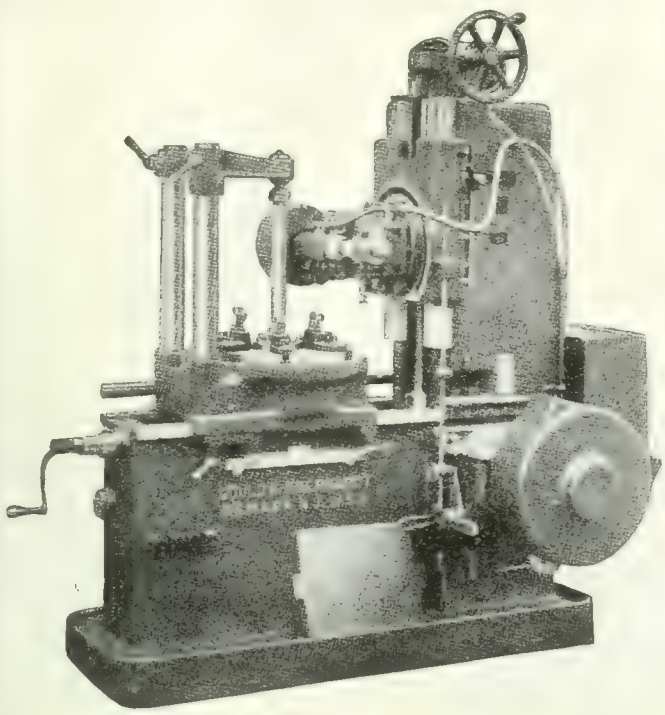
BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.



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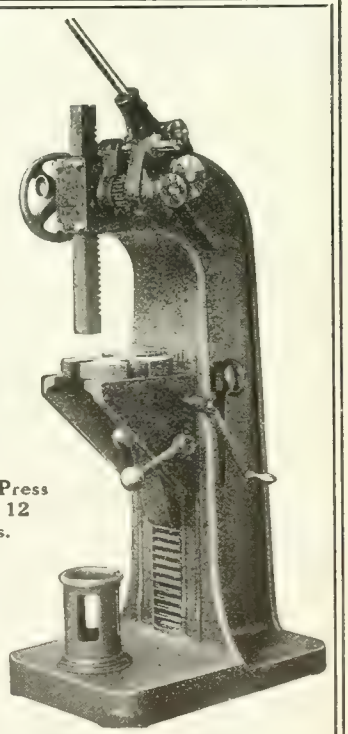

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

London, Ont.—E. Leonard & Sons contemplate building an extension to their works.

Hamilton, Ont.—The Canada Screw Co. are considering building an extension to their plant.

Copper Cliff, Ont.—The Canadian Copper Co. are building a pumping station for a sewage disposal plant.

Vancouver, B.C.—The Vulcan Iron Works will build and machine a shop on Industrial Island, to cost $30,000.

Copper Cliff, Ont.—The Canadian Copper Co. will build a blast furnace and converter to cost $200,000. The Dominion Bridge Co. will supply and erect the steel work.

Toronto, Ont.—The Consumers' Gas Co. has been granted a permit to erect a one-storey brick building at the corner of Parliament and Front streets for a "booster" house at a cost of $27,000.

Cookshire, Que.—The Westbury Electric Light & Power Co. are installing a hydro-electric plant. Tenders have already been called for the construction of a concrete dam.

Goderich, Ont.—The National Shipbuilding Co. is arranging for the use of the Paget factory and Mr. Paget, of Huntsville, was in town this week in connection with the arrangements.

Sidney, N.S.—The Dominion Steel Corporation has started extensive improvements to the Wabana properties which will increase the output of iron ore from 800,000 to 1,600,000 tons. The cost of the work is estimated at $1,500,000.

Cobalt, Ont.—It is reported here that construction work on the Hangingstone Falls power plant is about to be suspended owing to the inability of the contractors to secure the required number of workmen to complete the work in the specified time.

GENERAL

Three Rivers, Que.—The Three Rivers Box Co. will build a factory here.

Winnipeg, Man.—The Alaska Bedding Co. are building an extension to their factory.

Curling, Nfld.—Fire at Middle Arm, near here, destroyed Flett's Herring packing plant, several saw mills and other property. No estimate of the damage was obtainable.

Regina, Sask.—The North Star Drilling Co. plant in the northeast part of the city was destroyed by fire last week. The loss is estimated at $18,000, on which there was only $1,500 insurance.

Montreal, Que.—The William Rutherford Lumber Co's. storing warehouse, on the bank of the Lachine Canal, near the Napoleon Bridge, was destroyed by fire last Friday, with damage estimated at about $40,000. The blaze originated from the explosion of a barrel of tar. The loss is covered by insurance.

MUNICIPAL

Calgary, Alta.—The Hospital Board decided to ask the City Council to submit a by-law for $200,000 for hospital extensions.

Montreal, Que.—The Board of Control are considering a proposition made informally by the Cook Construction Co. to discontinue all work on the aqueduct, owing to the scarcity of labor and the price of material.

Owen Sound, Ont.—The County Council have given the third reading to the country good roads by-law. With the adoption by Grey and Bruce Counties of the good roads by-law, the Southern Georgian Bay Counties all come under the provisions of the Statute.

PERSONAL

James Carruthers, of Montreal has donated three aeroplanes valued at $22,500 to the Canadian Aviation Fund.

R. C. Miquelon has been appointed Quebec agent for the Standard Machinery and Supplies Ltd., successors to the Montreal Machinery and Supplies Ltd.

E. H. Beazley, manager of the Union Steamship Co., of British Columbia, left Vancouver, B.C., for England. He is going over to look into the shipping situation, and will be away for several months.

A. M. McLeod has been appointed agent for the lower provinces with headquarters at Sydney, N.S., for the Standard Machinery and Supplies Ltd., successors to the Montreal Machinery and Supplies Ltd.

O. M. Hennessy, manager of the Abitibi Pulp and Paper Co., was drowned in the Couchiching Rapids, near Lake Abitibi. He was appointed manager of the company six years ago when that concern was organized.

N. A. Marsh, of the John verMehr Engineering Co.'s engineering staff, Toronto, has left for an extended trip to Brazil, South America, to supervise the erection of the verMehr water filtration plant which is being constructed at Pernambuco.

A. S. Hamilton, for 14 years Master Mechanic of the Western Fuel Co., Nanaimo, B.C., has resigned from his position owing to ill health. He was recently presented with a cheque and an illuminated address by the staff of the mechanical department as a token of esteem is which he was held by his friends.

H. N. Reynolds has taken a position as sales manager for the Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont. Mr. Reynolds was formerly with the Michigan Alkali Co., of Wyandotte, Mich., and has had considerable experience as a salesman. He will shortly make a trip through Canada in the interests of his firm.

Sub-Lieut. Robert Leckie, D.S.O.—Formerly of Toronto, has been awarded the Distinguished Service Cross for attacking and destroying the Zeppelin L-22 off the east coast of England on May 14th. Lieut. Leckie is a native of Scotland, and was born in Glasgow 24 years ago. He is a nephew of John Leckie, and had been in Toronto for ten years previous to his training here for attachment with the Naval Aerial Service, and was connected with the firm of John Leckie and Co., Marine Supplies, Toronto.

NEW YORK LETTER

(Continued from page 32.)

tractor makers are steady buyers of machine tools.

The United States Government is assuming direct control of the export situation and is reported to have already refused permits for machinery shipments to Sweden, but the Washington administration is disposed to act conservatively in this respect. England and France are quietly placing orders for machine tools for prompt delivery and will be accorded all facilties possible to make speedy purchases and shipments.

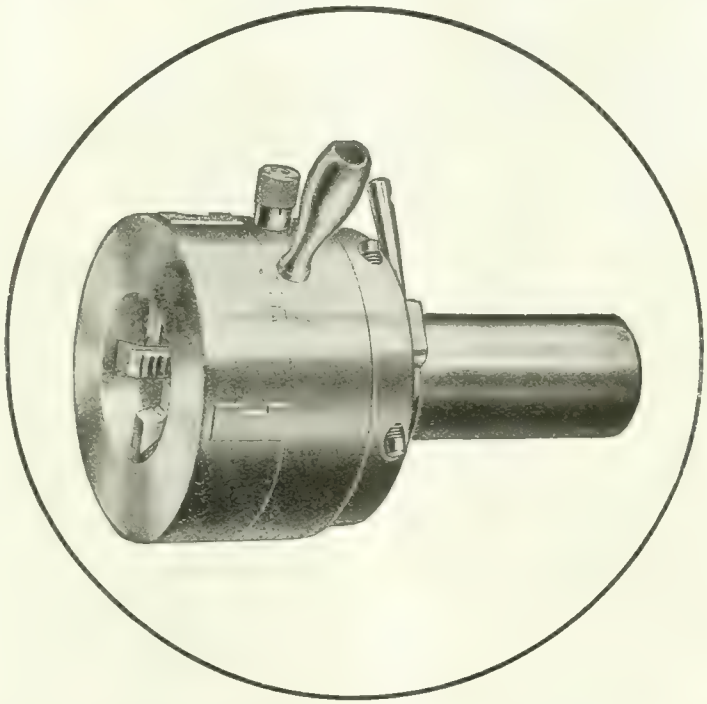
All of the United States steel concerns, especially the subsidiaries of the United States Steel Corporation, are giving preference to Government work and some of these mills are taking no commercial orders at all. It is estimated that thus far the army and navy departments have placed miscellaneous orders for about 1,000,000 tons of steel, of which 40,000 tons are for construction of war craft. At the moment all interest is centered in the prices of steel products that the Government will establish.

TENDERS

Outremont, Que.—Tenders will be received up to July 18, for the construction of an incinerator. Specifications may be obtained from J. A. Duchastel, city engineer, City Hall.

Toronto, Ont.—Tenders, addressed to the Secretary-Treasurer of the Board of Education, will be received until July 13, for hardware, Orde Street School. Manual training benches, Earl Grey School, steel work, Queen Victoria School and other midsummer repair work. Specifi-

GEOMETRIC



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cations may be seen and all information obtained at the office of the Superintendent of Buildings, Administration Building, 155 College Street.

Kingston, Ont.—Tenders will be received until July 16 for the reconstruction of part of the cribwork wharves at the entrance to the Dry Dock, at Kingston, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, the offices of the District Engineer, Equity Building, Toronto, Ont., and on application to the postmaster, at Kingston, Ont.

MARINE

Quebec, Que.—Quinlan & Robertson have a contract for the construction of four steamers.

Quebec, Que.—To encourage shipbuilding the civic authorities probably will open various docks near Quebec, in addition to those that have been working for the last few years on the south shore.

Vancouver, B.C.—The auxiliary schooner Laura Whalen will shortly sail on her maiden trip. She has on board 1,551,401 feet of B. C. lumber, consigned to Port Adelaide, Australia, and Capt. Hugh Docherty will go out in command.

Vancouver, B.C.—The call of the Imperial Munitions Board for tenders for 125 winches and windlasses has been heard and tenders are being filed with the Metal Trades Association. A committee of this body is dealing with the Munitions Board.

Vancouver, B.C.—The schooner Jessie Norcross, now fitting out at North Vancouver, is to leave shortly for Genoa Bay to load lumber for Port Adelaide, Australia, and the Janet Carruthers is to be launched next week from the No. 2 Wallace Yards.

Victoria, B.C.—The extension of the Cameron Genoa Mills Shipbuilders' plant is being made, which will carry the boundaries of the shipyard to a point on the Songhees Reserve almost meeting the area occupied by the Foundation Co., and preparations will soon have been completed for the laying down of the first keel in the Government ship programme.

St. John, N.B.—Grant & Horne have been given a contract by the Imperial Munitions Board to build two wooden ships at their new yard in Erin street. They are to be 250 feet long with 43½ feet beam, and will have 25 feet depth of hold. The speed will be 9½ knots and the boats will have a cargo capacity of practically 3,000 tons. The engines will be supplied by the Board.

Charlottetown, P.E.I.—It is expected that by next August the car ferry "Prince Edward Island" will start running between Point Borden, Prince Edward Island, and Cape Tormentine, N. B., the route for which she was built. The steamer has been running between Charlottetown and Pictou and Georgetown and Pictou for the past two years, as the docks between Tormentine and Borden were not ready.

Vancouver, B.C. — The Vancouver Dredging & Salvage Co. are working on the wreck of the steamer Eva Marie, which went ashore on a reef near Helmcken Island on June 8. Owing to the helpless position of the craft, it has now been decided to salve the boilers and engines and whatever cargo it is possible to reach. To do this it will be necessary to cut the hull open, as there is no hope of saving the steamer in her present position.

Port Arthur, Ont.—On June 23, the Port Arthur Shipbuilding Co. launched the steamer, Ugelstad, which has been built for the Great Lakes Transportatios Co. It is understood the company has already disposed of it to Norwegian capitalists. Miss Eva Powley of Port Arthur christened the boat in the orthodox way. The boat is a freighter of canal size, 261 feet long, 43½ feet beam with a depth of 28 feet. Her carrying capacity is 4,200 tons.

Victoria, B.C.—The sixth and last keel covered by the contracts at present held by the Cameron Genoa Mills Shipbuilders, for auxiliary schooners, was laid down on June 23 on the ways vacated by the schooner Esquimalt, which was launched on the night of June 13. On the completion of these vessels, the company will thereafter have its hands full in rushing to completion the four wooden steamers for which it holds contracts from the Imperial Munitions Board.

Owen Sound, Ont.—Word was brought here a few days ago of the total destruction by fire of the fisheries patrol motor boat "Wawanna," which took place at Fitzwilliam Island, in the channel between Georgian Bay and Lake Huron. The "Wawanna" was formerly a pleasure cruising vessel, built for Henry Manley, of Meaford. Her steam power was removed last summer, a powerful gasoline motor installed and other improvements were made, and the vessel went to Lake Erie to go an patrol service.

Esquimalt, B.C.—The contract for repairing the C.P.R. steamer Princess Maquinna which struck an uncharted reef of Kyuquot Sound, has been awarded to Yarrows, Ltd. The vessel has been hauled out on the ways at the local plant, where a survey was made. It is expected that three weeks will elapse before the Maquinna is ready for service again as there are eleven plates to be removed, five to be taken off and fared and six to be fared in place, in addition to other work, the damage being quite extensive.

Port Arthur, Ont.—When the dredge Kinnequhair leaves the Port Arthur dry dock she will commence a 6,000 mile journey, which will not be completed until Hudson's Bay is reached. The vessel is now having her anchors, cranes and other parts removed in preparation for the trip. The dredge was purchased this spring by the Canadian Government from the Canadian Dredging Co., and will be used in dredging at Port Nelson. It is expected the vessel will be at least one month in making the trip. Capt. W. M. Bradley, of Fort William, will be in command.

St. John, N.B.—B. A. Saker, of Montreal, before the Common Council, made his proposal for the establishment of a shipyard on the Warner Mill on the river front. He has secured the mill property with a thousand feet frontage on the river, and the lease of the adjoining property. He said that it was his intention to spend at least $100,000 during the first year in establishing yards capable of turning out three wooden vessels at the same time. When materials are available agin, he intends to undertake the construction of 3,000-ton tramp steamers, which would require an additional investment of $200,000.

TRADE GOSSIP

The Canadian Furnace Co., Port Colborne, Ont., has increased its capital stock to $1,500,000.

The Deloro Smelting and Refining Co., have opened up their own sales offices at 315 Graig St. West, Montreal, with B. Horwood as manager. The product (Stellite) of this firm was formerly handled by the Canadian B. K. Morton Co. of Montreal.

Nova Scotia Steel Output.—The output of the Nova Scotia Steel and Coal Co., for the first quarter of the year was as follows:—Coal mined, 146,525 tons; ore mined, 12,177 tons, limestone quarried, 21,074 tons; coke made, 25,545 tons; iron made, 21,103 tons; steel ingots made, brushed steel and forgings, 28,598 tons.

Tungsten More Active.—The demand for tungsten in the primary markets has been quite active recently and considerable business has been done for delivery during the balance of the current year. Beyond this producers are willing to quote. The market in New York is strong on light arrivals. The present market is equivalent to about $2.25 per pound tungsten.

Shortage of Sextants.—Numerous new vessels building in the United States have depleted the stock of chronometers and sextants and with Germany not furnishing them as before, and England requiring those manufactured for British ships, it has been asked that endeavors be made to have the Navy Department assist in relinquishing extra chronometers carried on vessels.

British Government Extends Embargo.—The British Government has prohibited the export of the following materials from the United Kingdom: Bobbins, lactates, lactic acid, potassium carbonate, ferro-manganese, unrifled firearms, hobnails, mica block and splittings, linseed oil, motor spirit, turpentine substitute, paraffin and petroleum, mineral lubricants, oil fuel.

U. S. Government Control.—Extension of American Government control to iron and steel and their products, petroleum and its products, farm implements and sisal, jute and hemp products, such as binding twine has been decided upon as an amendment to the administration food control bill by a

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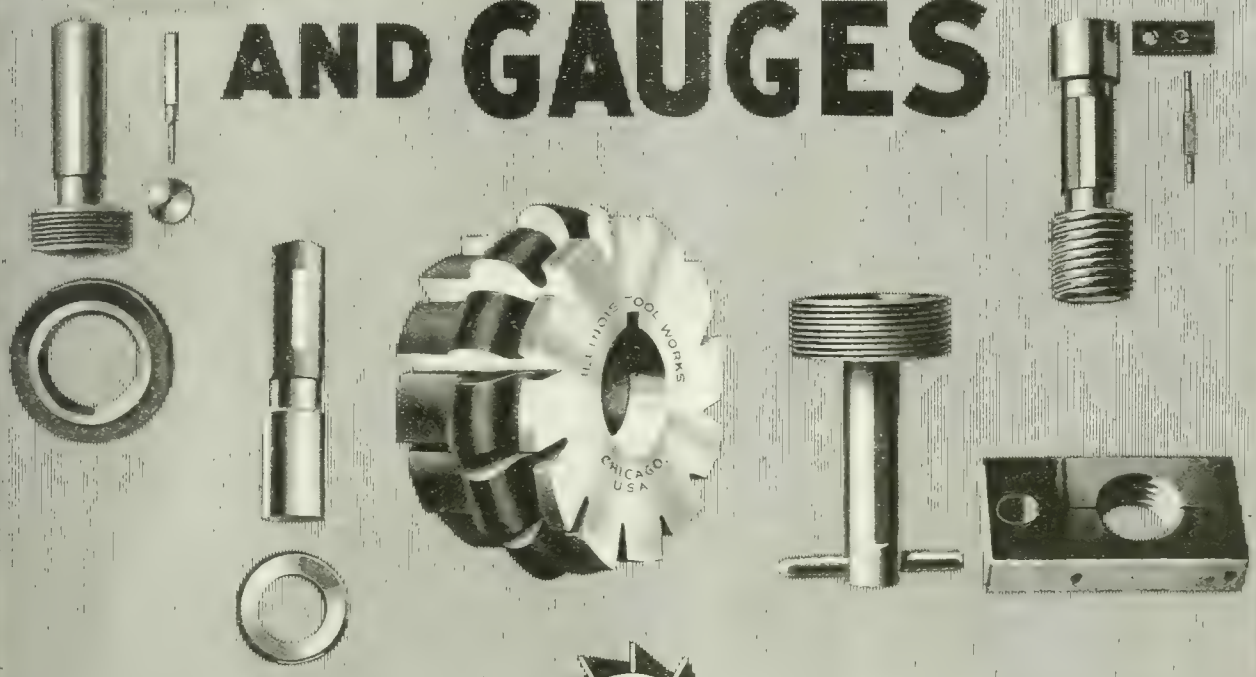

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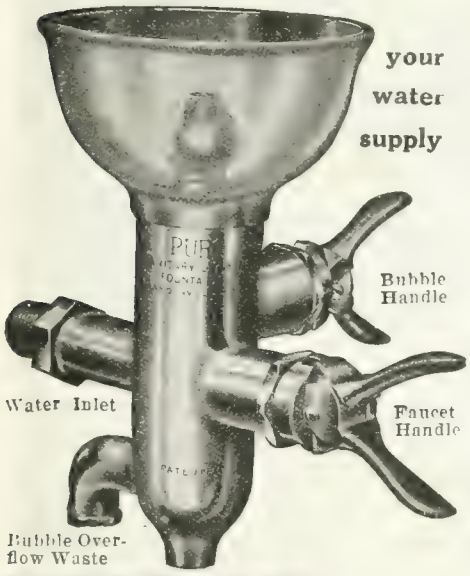

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Brass Castings,
Special
Machinery
Made to
Order

Senate agriculture sub-committee. Addition of other articles is under consideration.

Customs Returns Beat All Records.—The Dominion customs receipts in the first three months of the fiscal year, which ended on Saturday, eclipsed all records with a total of $46,680,203. In the corresponding period it was $35,431,404, or an increase this quarter of $11,248,798. June revenue was in keeping with the general showing. It amounted to $15,386,678, compared with $12,030,451, an increase of $3,536,226.

The National Shipbuilding Co., Goderich, Ont., is just completing the first of the marine engines which it has contracted to build and the engine will be ready for shipment shortly. This is a 500 horse power engine and weighs about 20 tons. It will be shipped to the Canadian Vickers, Montreal. The company has contracts for some larger engines, which will be about 1,400 h.p. and will weigh 110 tons. These will be for use in wooden vessels.

Brandon, Man.—Negotiations have been completed for the sale of the Brandon Electric Light Co's. plant, properties and business to the Canada Gas and Electric Corporation, which is understood to be composed of a number of American financiers. The purchase price, it is said by Manager Paterson, is approximately one million dollars. It is the intention of the purchasing company to also acquire the Brandon Gas Co's. plant and business .

Scarcity of Coal in Saskatchewan.—Thomas M. Molloy, secretary of the Government Bureau of Labor, states that the fuel situation in Sasketchewan is serious, and that it will be impossible to secure a sufficient supply of coal to meet the requirements of this province during the coming winter, even if all the Alberta coal mines are to resume operation once. Citizens are advised to use wood in the early fall months and at all other times when weather conditions permit.

Stationary Engineers Meet.—At the annual meeting of the Canadian Association of Stationary Engineers in the Temple Bldg., Toronto, the following officers were elected: President, H. Stevens; vice-president, S. Bamfrith; treasurer, John Brown; recording secretary, G. F. Moore; financial secretary, A. M. Wickens; conductor, H. Taylor; door keeper, W. Turner; delegates to the annual convention, J. Brown and S. Bamfrith; Alternatives, H. Stevens and T. Pope. The convention will be held in Toronto next July.

Restrict Use of Tin.—An announcement by the Commerce Department, Washington, D.C., said that by August 1, tin plate manufacturers will be in a position to furnish can makers with all the tin they need. All supplies of tin have been cut off from users for containers of varnish, blacking, paint, talc, soups, baked beans and various ready-to-eat foods, so that the tin may be used for cans in which perishable food can be packed. No releases of cans to packers of non-perishable products will be made until it is certain that the supply for perishables is ample.

The Winnipeg Gear & Engineering Co.—Makers of all kinds of cut gears, and designers and builders of special machinery, have recently doubled their floor space at 197-199 Princess Street, Winnipeg, Man. They expect before long to occupy the whole of the next floor. Since this company was organized less than a year ago, they have undergone considerable expansion, and are now extending along new lines which necessitates this increased floor space.

Reduction in Coal Prices in the U.S.—An immediate general reduction of $1 to $1.50 a ton in the price of soft coal at the mines was agreed upon at Washington on June 28 by representatives of the coal operators to take effect on July 1. This reduction is expected to be followed by still further decrease in price after investigation into the costs of mining coal, and it is probale that the Government will be given a still lower price than that to the general public. About 600,000,000 tons of coal were mined in the United States last year.

Vancouver, B.C.—The first unit of the Pacific Mills plant at Ocean Falls, is now in operation and is turning out 75 tons of news print daily. By the end of the present year a second unit with a capacity of 120 tons of paper is expected to be in operation, and the daily production will then reach 195 tons. While the present program of development ends with the starting of these two units, it is regarded as probable that there will be extensions to the equipment and a still further increase of production before very long. Meanwhile the plant will be worked to its full capacity.

Canadian Boats in Coastal Trade.—The United States coastwise laws have not been suspended, but arrangements have been made whereby Canadian vessels can trade between American ports. This is a war measure, and the plan, which will increase vessel capacity on this side, will probably be in operation the balance of the season. It is figured there are about twelve or fifteen Canadian vessels that can be placed in American coastwise trade for part of the season, but boats of that class have some contracts, and they will, of course, carry grain as soon as the fall movement starts at the Canadian head of the lakes.

Quebec Bridge Progress.—It is understood that the new Quebec bridge will be ready for placing in position some time in September. Fabrication has been almost completed at the works of the St. Lawrence Bridge Co. and the erection of the span will be immediately proceeded with at the old location at Sillery Cove. It is fully expected that the process of raising the span from the scows to the arms of the cantilevers, will be along similar lines as that adopted last year, but additional precautions will be made for the safety of the workmen.

Nickel in Ontario.—Nickel mining is of first importance in Ontario. In 1915 the nickel contained in Sudbury matte

amounted to 34,039 tons, valued at $17,019,500. In 1915 the output was 42,000 tons, worth $21,000,000. During 1916 both of the operating companies, the Canadian Copper Co. and the Mond Nickel Co., worked to their fullest capacity their mines and smelters in Ontario, as well as their refineries, one of which is in New Jersey, the other in Wales. Other sources of nickel in Canada are the nickel oxide obtained by the refineries from the ore of the Cobalt district and the Alexo mine. A little metallic nickel was obtained elsewhere during the year, but production was relatively unimportant.

Many Oppose Freight Advance.—The railways found solid opposition at the hearings before the Board of Railway Commissioners held at Winnipeg last week for the purpose of considering a proposed freight increase of 15 per cent., and a new freight classification. Representatives of every important industry in Winnipeg presented evidence of a convincing character against the increase. In many cases the proof was so strong as to indicate paralysis of business in certain lines. So many witnesses had to be heard on the subject of revising the demurrage rules and on the re-classification plan that the commission was not able to take up the percentage increase asked by the roads. It was shown by nearly every industry that the proposed new classification, in itself, was an increase in rates more to be feared than the percentage increase. On the demurrage question all shippers stood firmly for an equitable rate, but none believed the $3 a day as a starter after the two free days was justifiable. The Canadian Manufacturers' Association approved of the proposed increase in freight rates.

BUILDINGS

Toronto, Ont.—J. W. Woods, of Gordon McKay Co., has taken a permit to erect a warehouse at 37 Pearl Street costing $15,000.

Toronto, Ont.—A permit has been issued to S. and L. S. Yolles, 67 Baldwin Street, to erect a two-storey brick warehouse at 1100-1104 Queen Street West, the cost of which is estimated at $10.000.

Chatham, Ont.—The Canadian Contractors and Builders, have commenced work on the $60,000 addition to the Queen Mary School. The contract calls for completion of the building by October 15.

RAILWAYS—BRIDGES

Charlottetown, P.E.I.—A campaign has started here to urge the Dominion Government to standardize the gauge of the Prince Edward Island Ry., in order to get full benefit from the car ferry system which it is expected will be inaugurated next August.

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1 24" CONRADSON TURRET LATHE. APPLY McGregor, McIntyre, Limited, Toronto, Ont. c3m

FOR SALE—THREE 26" x 12' C.M.C. DOUBLE back geared quick change gear engine lathes; never been used. McKinnon Dash Company, St. Catharines, Ont. **c2m**

FOR SALE—10 PRACTICALLY NEW NO. 7-C Heavy Duty Racine Hack Saw Machines. Suitable for all cutting purposes. For further information and price address The Peck Rolling Mills, Limited, Montreal. c3m

RADIAL DRILL, 4' CINCINNATI BICKFORD with single pulley drive and speed box, for sale or exchange for 6" Radial Drill; also Mitts & Merrill Keyseater, 12" stroke to cut 2" wide keyways. Boving Hydraulic & Engineering Co., Ltd., Lindsay, Ont. c26m

FOR SALE TWO 16 x 6 REED PRENTICE Automatic Lathes. One Bertram Gap Lathe, 48 x 10. Four No. 10 Heavy Duty Baker Drills. One No. 2D Colburne Drill. One Heavy Duty Reliance Machine Co. Turret Lathe for inside boring of 6" shells. Canadian Blower & Forge Co., Kitchener, Ont. c24m

WE HAVE ON HAND AT OUR WELLAND Works, for disposal, the following new machinery: One (1) 18" x 15 ft. Accumulator; one (1) Aldrich Triplex Hydraulic Pump, 180 gals. capacity; two (2) 350-ton B. and B. Presses. All offers will be carefully considered. Canadian Car & Foundry Co., Ltd., Transportation Building, Montreal.

1—ROBB HORIZONTAL STEAM ENGINE, 10 x 12, 35 h.p. Just overhauled by makers. Price $300.00. 1—Heavy Duty Rockford Drill. Suitable for shells or heavy work. Weight of drill 3,600 lbs. Good as new. Write for specification. 1—Jones & Lamson 2 x 24 Turret Lathe, 2¼" hole in spindle, 16" swing, cone drive, collet chucks for bars up to 2" diameter. Or lathe can be fitted with standard universal chuck. Flat turret 16" diameter. Good condition. Price $400.00. 1—Warner & Swasey Turret Lathe. Round turret, diameter 8", hand cross feed for turret. Swing 14". Fairly good condition. Price $200.00. 1—Bertram 2-spindle Thread Miller. Made by makers for threading 18-pdr. shells. Now used for threading sockets. Good condition. Steel Furnishing Co., Ltd., New Glasgow, Nova Scotia. c2m

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SHELL PLANT FOR SALE — COMPLETE plant—installed since 1914, for the machining and assembling of 4.5 inch H.E. shells, situated at Dartmouth, Nova Scotia, on line of Intercolonial Railway, with siding running into the works. Will sell the equipment outright, with privilege of renting the building in event of the purchaser engaging in the same business. Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia, Canada. c26m

FOR SALE—A MEDIUM-SIZED TWO-STOREY brick factory situated in the best small city in Ontario. Buildings in good condition, suitable for either metal or wood-working; shipping facilities unexcelled. Two trunk lines; direct connections east, west, north and south. Educational advantages the very best. Plant will be sold at a bargain and on easy terms of payment, if desired. Apply Box 294, Canadian Machinery. c2m

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WANTED — THREE GOOD SECOND-HAND air hoists 3" diameter by 4' lift. McKinnon Dash Company, St. Catharines, Ont. c26m

300-TON PRESS SUITABLE FOR NOSING 4.5 Howitzer Shells, complete with triple pump, accumulator, and fittings. McGregor & McIntyre, Limited, 1139 Shaw St., Toronto, Ont. c26m

WANTED—THREAD MILLER FOR NOSE OF 4.5 mark VII. shell. Must be in good order and price reasonable. J. C. Wilson & Co., Belleville, Ont. c26m

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No. 28—17" x 96" Brown & Sharpe Plain Grinder.

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No. 1½ Bath Universal Grinder, complete tool room equipment.

No. 1½ Landis Universal Grinder, for Internal and External Grinding.

36 ft. Niles Plate Planer.

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PRACTICAL WORKS MANAGER AND MECHANICAL expert with years of experience in United States and Canada, a specialist in munition work, open for engagement. Best of references. Apply Box 304, Canadian Machinery. c4m

ELECTRICAL ENGINEER—COLLEGE GRADUate, five years' practical experience; now employed in large industrial plant, electric-driven; responsible position desired; money not sole object; recommendations. Box 305, Canadian Machinery. c26m

TORONTO ENGINEERING AGENCY WANTS positions for thorough mechanics, toolmakers, toolsetters, grinders, borers, automatic operators, general foremen, chief munition inspectors, and men to work on marine copper piping; also for female artisans of all kinds, viz., munition inspectors, operators, superintendents, timekeepers and female elevator attendants, tall, age over thirty; matrons. Employers send to 57 Queen W., Toronto, Adel. 809. c26m

SITUATIONS VACANT

THOROUGHLY CAPABLE BRASS FOUNDRY Foreman to take charge of small foundry doing a general jobbing business and also munition work. Location Montreal. Address for information, "Brass Foreman," P.O. Box 1934, Montreal. c26m

WANTED—TWO EXPERIENCED BORING lathe hands to take charge on day and night shifts, of battery of boring lathes for 6" Mark III. shell. Only men who can get good bores and high production need apply. Give in the first instance, experience, wages required and full particulars, otherwise application will not be considered. Box 317, Canadian Machinery. c26m

WANTED — ASSISTANT SUPERINTENDENT for six-inch shell factory. Must be capable of getting maximum production from an established plant and have good mechanical experience. Duties to consist chiefly in supervising production. Give full particulars in writing of previous experience, age, references, and salary required, to Henry Hope & Sons of Canada, Ltd., Peterboro. All information will be treated in the strictest confidence. c5m

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TORONTO ENGINEERING AGENCY ARE REquested to find six good all round machinists, non-union men, 45c per hour, for permanent munitions plant. Men will be paid more according to ability. For town sixty miles from Toronto. Also three engine lathe men and good toolmakers for town sixty miles from Detroit, 45c per hour. More will be paid according to ability. Also lathe hands for night shift, city plant. Employment Agency, 57 Queen W., Toronto.

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Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.
1 Lindeman Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.
1—Flather & Co. 14" x 5' 0" Lathe, with chuck and countershaft.
1—Foslick 16" x 6' 0" Lathe, with collet chuck and countershaft.
1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.
1—Goldie & McCulloch Nosing Press with Dies.
1—Beatty Accumulator.
1—Lees-Bradner Thread Miller, with attachments and countershaft.
1—Jones & Lamson Turret Lathe, 2" x 24".
1—40-gallon Bowser Tank and Pump; good as new.
1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.
1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.
1 Thermo Couples, 39" long, bent 12½" from nose.
1 Thermo Couples, 39" long, straight
1 One-Connection Tycos Pyrometer, made by Taylor Co.
1 Bertram Band Turning Attachment, for 24" Lathe. Ball bearing Centre.

All the above located at Welland. Prices, Delivery and full particulars gladly furnished.

M. Beatty & Sons, Limited
Welland, Ont.

FOR SALE

20" Bullard Projectile Lathe
21" Gisholt Turret Lathe
20" x 6' Florence Turret Chucking Lathe
16" x 7' Oliver Engine Lathe, new
18" x 10' Rahn-Larmon Engine Lathe, new
18" x 12' Rahn-Larmon Engine Lathe, new
3 x 36" Jones & Lamson Flat Turret Lathe, Chucking
3¼ x 36" Cincinnati Acme Flat Turret Lathe, Chucking (4)
Ford-Smith Grinders for 3" shells (12)
Allis-Chalmers Banding and Waving Machines (10)
Copper Band Turning Machine
Greenlee Gang Boring Machine
Holden-Morgan Thread Miller

Brownell Machinery Co.
Providence, R. I.

One Inch Space
$3.00 Per Issue
on Yearly Order.

H. W. PETRIE of MONTREAL Limited Montreal, Que.

LIST OF NEW AND USED MACHINERY IN STOCK FOR IMMEDIATE SHIPMENT

ENGINE LATHES

New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
S.H. 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 18" Hex. Power Feed Turret.
New No. 0 Foster Plain Head Screw Machine, with wire feed and automatic chuck.

DRILLS

New 3' Dresses Plain Radial, Gear Box Drive.
New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Atkins Kwit-Kut.

GRINDING AND BUFFING MACHINES

New 36" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.
New Style B. Point Yankee Twist Drill Grinder.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

15" x 5½' American, fox.
16" x 6' Pratt & Whitney, turret.
18" x 6' Prentice, high speed.
22" x 8' Pratt & Whitney.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
32" x 18" Lodge & Shipley, pulley.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

14" x 6' Lodge & Shipley.
15" x 6' London, back geared.
16" x 8½' Cincinnati, D.B.G.
17" x 8' Blaisdell, back-geared.
18" x 6" New Haven.
18" x 10' Putnam, back-geared.
20" x 8' Fifield, back geared.
21" x 9' back-geared, single purpose (4).
22" x 8' Bawden.
24" x 11' Pond, back-geared.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, back geared.
31" x 16' Fifield, back-geared.
48" x 32" x 12' C.M.G. gap.
20" x 38" x 16' double back gear, gap.
24" x 44" x 20' C.M.C., gap.

UPRIGHT DRILLS

13" Perfect, 2-spindle.
14" Excelsior, sensitive.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
21" Silver, back-geared.
22" Barnes, back-geared.
24" Kerkhoff, sliding head.
26" Prentice.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
24" x 34" x 8' Cincinnati, 2 heads.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Nos. 0 and 1 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
Monarch, vertical.
Loudon, universal.

SHAPERS.

16" Hendey.
16" Queen City, back geared.
20" Cincinnati, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS

6" and 8" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 West Tire Hydraulic Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

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RIVERSIDE'S Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—18 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putman Standard Engine Lathe.
1—22 x 14 Putman Standard Engine Lathe.
3—New 16 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 8 Springfield Engine Lathe.
2—16 x 8 Davis Engine Lathes, taper attachment.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 Potter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 6 Lodge & Shipley Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Hamilton Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.

1—34 x 36 Jones & Lamson Flat Turret Lathe, S.G.H.
1—24 x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—[illegible] x 24 Jones & Lamson Flat Turret Lathe, cone head.
4—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
2—No. 5 Pierson F.G.H. Hand Screw Machine.
1—No. 4 Smurr & Kamen Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, nigger feed.

MILLING MACHINES AND PLANERS.

5—No. 1½ Knight Milling and Drilling Machines.
3—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
1—No. 1 Cincinnati Plain Milling Machine.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—25 x 25 x 7' Cincinnati Planer.
1—22 x 22 x 5' New Haven Planer.
1—30 x 30 x 3' New Haven Planer.

DRILL PRESSES.

1—21" Baker Heavy Duty High Speed Drill.
1—3-spindle 20" overhang Henry & Wright High Speed Drill.
3—12" Leland & Gifford High Speed Bench Drills.
5—20" Buffalo Plain Drill Presses.
4—6 Spindle Fox High Speed Drill Presses.
2—4 Spindle Fox High Speed Drill Presses.
1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill.

SHAPERS AND SLOTTERS.

1—24" New Barker Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—16" Hendey Geared Shaper.
1—16" Garvin Shaper.
1—16" Ohio Crank Shaper.
1—16" Smith & Mills B.G. Crank Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—24" Niles Geared Type Slotter.

PRESSES AND HAMMERS.

1—Waterbury Farrell Straight-sided Geared Press with double cam knock-out.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B & S. Roll Board Hammer.
1—800-lb. Pratt & Whitney Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—24-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—8 x 6 Westinghouse Steam Air Compressor.
1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—10 x 10 Ingersoll Sargent Belt-driven Air Compressor.
1—10 x 10 Claxton Belt-driven Air Compressor.
1—9 x 8 Ingersoll Rand Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co.'s Belt Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt-driven Air Compressor.
1—6 x 6 Chicago Pneumatic Tool Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps, and Electrical Equipment of all kinds.

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ELECTRIC TRAVELING CRANES.

50-Ton Niles, 61' 7" span, fish belly type, four motor, 550 volts D.C., with 10-ton auxiliary hoist.

50-Ton Alfred Box, 50' 0" span, fish belly type, four motor, 220 volts D.C., with 5-ton auxiliary hoist.

Hand Cranes, 2 to 7½ Ton, 22' span, C3

BRAKE AND PRESSES.

13' 6" Garrison Brake or Press, double back-geared, capacity ¼" plate full width, weight about 156,000 lbs.; condition like new.

No. 11 Perkins (Trimming), 4" stroke, 16,500 lbs.

No. 225 Adriance (Punch), 2" stroke, 7,000 lbs.

No. 65 Toledo (Cam Drawing), B.G., 13,000 lbs.

PUNCHES AND SHEARS.

Punch and Shear, cap. 2" x 1¼ throat 48".

Punch and Shear, 17" throat, capacity 1 1-16" x 1".

Punch and Shear, No. 5-B New Doty (hand), capacity ¾ x ½".

Punch, Ohl (Hand), cap. ¾" x ¼".

Punch and Shear, for elliptic spring work, capacity shear 3 x ½", spring steel.

Rotary Bevel Shear, Lennox, cap. ½" plate.

Rotary Splitting, Lennox, 30", cap. ¼" plate.

Alligator Shear, No. 2 Farrell, cap. 1" squares.

Guillotine Shear, No. 6 Perkins, cap. 2¾" squares, weight about 16,500 lbs.

UPSETTING AND FORGING MACHINE

3½" Ajax Universal Type Upsetting and Forging Machine; excellent condition.

McCoy-Brandt Machinery Co.

Office and Warehouse:

216-218 Penn Ave., Pittsburgh, Pa.

FOR SALE

USED MACHINERY
In First Class Condition

1 LeBlond Engine Lathe, 20" x 8', swings 21½", quick-change gears, compound rest, 1¾" hollow spindle, back geared, fitted with 15" 4-jaw chuck.

1—Lodge & Davis Engine Lathe, 24" x 8', back geared, compound rest, power cross feed, with raising blocks to swing 32".

8—No. 26 Becker Plain Horizontal Milling Machines, practically new.

4—No. 4 Improved Lincoln Millers, manufactured by the Hendey Machine Co., Torrington, Conn., change gear box, A1 condition.

14—Hartford Automatic Screw Machines, manufactured by Pratt & Whitney Co., Hartford, Conn., ranging in capacity from 1" to 2½". These machines are in good used condition, and can be offered at attractive prices.

3—No. 7 Late Model Becker-Brainerd Lincoln Type Milling Machines.

1—24" Cincinnati Upright Drill, automatic feed, automatic stop, with tapping attachment.

1—28" Hoefer Upright Drill, with sliding head, positive geared feeds.

4—(New) 1½" x 9 Cincinnati Acme Hand Screw Machines, with friction back geared head, wire feed.

50 Lincoln Type Millers, consisting of No. 7 Becker-Brainerd, and other makes of similar size.

PRICES ON APPLICATION.

W. H. J. FITZGERALD & COMPANY

8 Oliver St. BOSTON 141 Milk St.

Machine Tools

IN

Cleveland Stock

BORING MILLS.

Foote-Burt 2-Spindle Vertical Cylinder Boring Machine, 4" spindles, 10" table feed.

36" Bullard 2-Swivel Head Vertical Boring Mill, 3-jaw table chuck, gear feed, cone drive; very good.

DRILLS.

20" Prentiss, hand and power feed, sta. hd., upright; very good.

21" Aurora, sliding head, power feed, bk. dg., very good.

26" Barnes, sta. hd., bk. gears, power feed; good.

36" Bickford Plain Radial Drill, cone drive, swinging table, belt power feed; very good shape.

42" Bickford, plain radial, single pulley drive, gear feed, tapping att., square box table, planed base; A1.

GRINDERS.

Greenfield Tool and Cutter Grinder, complete.

Landis 10 x 20 Universal Grinder, with all parts; very good.

LATHES.

14" x 6' LeBlond, with plain rest and plain feeds; good.

14" x 6' LeBlond Regular Engine Lathe, taper att., hollow spindle, screw cutting; complete.

24" x 24' Pond Comp. Rest Lathe, arranged for shaft turning, and including double tool holder and rests.

32" x 12' Prentiss Comp. Rest Lathe, belt feed, hollow spindle, all change gears and parts; in excellent condition.

PRESSES.

No. 2C Stiles Plain Punch Press, 12" throat, 1½" stroke, 24" flywheel; excellent condition.

76½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 18" stroke, 12" die space, 7" shaft.

77½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 10" stroke, 17" die space, 8" shaft

78½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 10" stroke, 24" die space, 10" shaft.

165½ Toledo Single Crank Toggle Drawing Press, capacity up to 25" blanks, 19" punch, will draw and lift out up to 9½".

MISCELLANEOUS.

75-lb., 7 150-lb. Bradley Upright Strap Hammers, good shape.

30" American Wood Band Saw, plain table, 4-step cone drive for 8" belt.

Peerless High-speed Cut-off Saws, 6"-9"-13" sizes.

Grant-Lees 18 x 4 Hobbing Machine, for spirals, spurs and worms.

Bement Miles Heavy Vertical Boring Machine, 7" spindle, capacity for drilling up to 12" or 15", solid steel.

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Offices 428 Leader-News Bldg. **Warehouse** 1031 West Front St.

CLEVELAND, O.

NEW MACHINE TOOLS
FOR IMMEDIATE DELIVERY

LATHES.

9" x 4' Seneca Falls Bench Lathe, with compound rest and countershaft

14" x 6' Monarch Quick-change Lathes, with cpd. rest.

17" x 8' Sidney Quick-change Lathe, with 3-step cone and double back gear.

15" x 7' Oliver Quick-change Lathe, with 3 step cone, double back gear, pan and pump.

24" x 10' Wickes Standard Lathe, with 3-step cone nad double back gear.

24" x 12' Wickes Standard Lathe, with 3 step cone and turret tool post.

GRINDERS.

No. 2 Cincinnati (12 x 36) Plain Grinder.

Six Fifteen Fitchburg Plain Grinder (Hand Feed).

Six-Fifteen Fitchburg Grinder (Automatic Feed).

No. 2 Bath Universal Grinder 10 x 25, "C" equipment.

No. 2½ Bath Universal Grinder 10 x 30, "C" equipment.

No. 3 Wilmarth & Morman Surface Grinder (8 x 24).

No. 2 Diamond Automatic Surface Grinder (36 x 12 x 12

No. 2 Oesterlein Universal Cutter and Tool Grinder.

No. 3 La Salle Plain Surface Grinder

Capitol Internal Grinder.

DRILLS.

No. 1 S Garvin B. G. Duplex Horizontal Drill.

MILLERS.

No. 1 American Lincoln Type Miller.

No. 6 Whitney Hand Milling Machine.

No. 1½ Valley City B. G. Plain Milling Machine

POWER PRESSES

No. 3 Niagara O B I Power Press

No. 5 Niagara O B I Power Press

No. 6 Niagara O-B-I Power Press

No. 5 Toledo Geared O B I Power Press

MISCELLANEOUS

1½" Dreses Friction Head Screw Machine. Power Feed to Turret

No. 15 Lea Simplex Cold Metal Saw.

No. 18 Lea-Simplex Cold Metal Saw.

¾" Geometric Threading Machine

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Also Woodworking Machinery, Shop Tools and Supplies.

Address: Machinery Dept., Chas. A. Strelinger Co., Detroit, Mich

C. W. CULLEN
MACHINERY CO.

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CLEVELAND, OHIO

American 5' Plain Radial Drill, 3" spindle, box table, b.g., tapping attachment, M.D.

Bickford 4' Plain Radial Drill, cone drive, La Pointe Broaching Machine.

Toledo No. 204 Spc. Double Crank Press.

Toledo 400-lb. Board Drop Hammer.

2 P. & W. No. 2 Cutting-off Machines.

Niles 48" and Industrial 36" Car Wheel Borers.

National Acme No. 4-D Four-spindle Drills.

Bement-Miles & Co. 7½' Spindle Vert. Drilling and Boring Mill.

2—No. 6 Rivett Grinders.

Gardner No. 24 Belt-driven Disc Grinders.

Bradley 150-lb. Upright Strap, 150-lb. helve, 75-lb. Upright Strap Hammers.

Detroit Japanning Ovens, 8' 10" x 8' x 152".

Gisholt 28" Turret Lathe, taper attachment, M.D.

Pratt & Whitney 48" Gap Lathe.

Hanna No. 1262 30-ton Riveter.

Pangborn Sand Blast, 84" rotary table, M.D.

No. 5 Becker Vertical Milling Machine, 22" round table.

3—800-ton G.E. Hydraulic Double Action Presses.

1 Toledo Toggle Press, No. 165½.

1—Ferracute Press, Dagg 66 Bliss Presses.

3 No. 60½ Rack and Pinion.

1 No. 77½.

1—No. 87 Special Geared.

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The Best Shrapnel Heat Treating Plant In Canada

HEALY'S FOUNTAIN DESIGN

For Sale at Half Cost of Installation. Capacity 1500 per 10 Hours

Economy, Quality and Quantity Absolutely Guaranteed

6—Oil Burning, Hardening and Annealing Furnaces.
4—Quenching Tanks with about 700 gallons Houghton's Oil.
Complete Pyrometer Equipment.
5—Oil Pumps for Fuel and Quenching Oil.
1—Root Blower, with motor.
1—Compression Oil Tank.
2—Extra Large Cooling Coils, pipe design.
Complete system oil piping and air piping.

This complete heat treating plant was not damaged by our recent fire and is ready now for operation.

TOOLS FOR 18 LB. SHRAPNEL

2—4½" Davis Cutting Off Machines.
1—End Centering Machine.
1—Symington Rough Turn Machine.
1—Bullard Turret Lathe, 20-inch.
1—24" Niles Engine Lathe.
1—20" Bawden Engine Lathe.
1—20" Lodge & Shipley Turret Lathe.
3—Symington Nose Tapping Lathes.
2—Symington Body Grinders.
2—Symington Finish Turn Lathes.
1—Symington Band Recess Lathe.
2—Symington Undercut and Waive Lathes.
2—18" Perkins Profile Engine Lathes.
1—18" Lodge & Shipley Engine Lathe.
1—18" Lodge & Davis Engine Lathe.
1—18" Putnam Engine Lathe.
1—20" Simplex Engine Lathe.
1—24" Davis Turret Lathe.
1—18" Essley Engine Lathe.
1—18" Rhan-Mayhr Engine Lathe.
1—18" Reed Engine Lathe.
1—West Banding Press, 4.5" size and pump.
1—Jenckes Band Turning Lathe.

1—Oil burning nosing furnace with water jacket, fourteen 18-pdr. holes or interchange water jacket providing ten 4.5 or seven 6" holes.

Assorted lots of tools, gauges, high speed steel, shafting, etc.

Above machinery is in very good working condition, slightly damaged by fire. Prices very low.

CLUFF AMMUNITION COMPANY

911 C. P. R. BUILDING

TORONTO, ONTARIO

FOR SALE

BORING MACHINE—VERTICAL.

1-30" Colburn, 1 turret head.
1-New 30" Gisholt, one turret head, Sept. delivery.
1-34"-42" New Colburn, one turret head, Aug. delivery.
1 34" Rogers, one turret head, Sept. delivery.
1—36" N-B-P, one plain and one swivel head.
2 36" B. & S., one turret head
12—New 42" Putnam—2 heads, Nov. delivery.
1—53" N-B-P, two swivel heads.
1-72" Niles, two swivel heads.

BORING MACHINES—HORIZONTAL.

1-Lucas, 2¼" bar.
1 New No. 1 Cleveland, 2½" bar.
1-Hoefer Horizontal Driller and Borer with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—New No. 2 Barrett Cylinder, Nov. delivery.

BULLDOZERS.

1 New No. 4 Garrison, same specification as No. 4 Williams & White.
1-No. 7 Ajax, 20" stroke.
1 No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1 8" x 8" Curtis, belt-driven.
1 10" x 10" x 10" Single Cylinder Smith-Vaile, steam driven.
1 10" x 12" Chicago Pneumatic, belt driven
1 12" x 12" American, belt driven.
1—16" x 12" Chicago Pneumatic, Duplex, belt driven.
1 10"-16½" x 15" Peerless, cross compound, steam driven.
1-22"-13" x 16" Ingersoll-Rand, motor driven.

CUTTING-OFF MACHINES.

2—No. 0 Brown & Sharpe.
1—2" capacity Warner & Swasey.
2—3" Curtis & Curtis.
3—4" Curtis & Curtis.

CRANES—ELECTRIC.

1—5-ton P. & W., 4-motor, 10' span, 25' lift, 220 v., D.C., with one ton auxiliary hoist.
1—8-ton Phoenix, 38' 10" span, 220 v., D.C.

DRILLING MACHINES—RADIAL.

1—New 3' Mueller, plain, speed box drive.
1—36" Bickford, plain, speed box drive.
1 New 3½' Mueller, cone drive, July delivery.
1—New 3½' Carlton, cone pulley drive.
1—New 3½" Western, July delivery.
2—4' Mueller, plain, speed box drive.
1—5' Bickford, plain, speed box drive.
1—5' American, plain, motor driven.
5—5' Special, 2½" spindle, arm does not raise and lower, hand feed.
1—New 6' Fosdick, speed box drive, July delivery.

DRILLING MACHINES—HEAVY DUTY.

3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—No. 26 Foote-Burt, 44" swing, 3½" capacity in solid steel.

DRILLING MACHINES—MULTIPLE SPINDLE.

1—30C Baush 12-spindle, capacity 1⅛" holes, 30" circle.
1—Gardam, 12-spindle, capacity ⅜" holes, 14" square.
1-No. 5 Fox, 12-spindle, rectangular head, 20" x 30", capacity 1" holes, tapping attachment, speed box drive.
1 14-spindle Baush, capacity 1" holes, 36" circle.

GEAR CUTTING MACHINES.

1 12" G. & E. Gear Hobber
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lees Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22" x 8" Gear Cutter for Spur and Bevel.
1—24" Fellows Gear Shaper.
1—24" x 8" G. & E. for spur and bevel.
1—26" x 10" Cincinnati, spur gears only.
1 No. 3 26" B. & S., spur gears only.
1 New 30" Flather, spur gears only.
3 36" Fellows Gear Shapers.
1-50" x 11" G. & E., spur gears only.

GRINDERS—UNIVERSAL—FOR CUTTERS, DRILLS, REAMERS, ETC.

1 New Norton, No. 1.
1-New Wilmarth & Morman, style BX.
1 No. 1 Cincinnati.
1 New Walker No. 2, outfit K (capacity 9" x 26").
4 No. 150 Wells.

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1 No. 11 (6 x 30") Brown & Sharpe.
1 6" x 48" Pratt & Whitney.
1 New No. 12 (8" x 26") Brown & Sharpe.
1-10" x 50" Norton.
1 No. 16 (10" x 72") Brown & Sharpe.
6 12" x 24" Modern, self-contained.
6 12" x 36" Modern, self-contained, motor driven.
6 12" x 48" Modern, self-contained, motor driven.
1—14" x 72" Queen City.
1 16" x 66" Landis, with crank grinding.
1 18" x 96" Brown & Sharpe.
1 New 10' x 36" Landis, immediate.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—No. 1 Fraser, with surface grinding attachment.
1—No. 1½ (10" x 30") Landis.
1-No. 2½ (10" x 36") Bath.
1 New No. 2 Bath.
1 10" x 42" Modern.
1—No. 2 (12" x 30") Brown & Sharpe.
10—New No. 2 Morse, cap. 12 x 30", Universal, Dec. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.

GRINDING MACHINES—INTERNAL.

1-No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—DISC.

1—No. 14 Besley.
1—New No. 17 Gardner (Pattern Makers).
1—No. 41 Oliver (Pattern Makers).

GRINDING MACHINES—RING.

1—No. 200 Heald.

GRINDING MACHINES—EDGE.

1-No. 374 Safety Emery Wheel Co.

GRINDING MACHINES—SURFACE.

1—No. 1 Diamond, cap. 12" x 12" x 24", automatic.
1 New No. 2 Reid (same as B. & S.).
1 22" x 12" x 60" Springfield, planer type, automatic.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, pistons, piston rings, etc., 16" feed, swivel table, water pump.

GRINDING MACHINES—FACE.

1—Diamond Face Grinder, 4' travel, 14" wheels.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1 150-lb. Bradley Helve, upright

HAMMERS—BOARD LIFT—DROP.

1—200-lb. (no name).
1—400-lb. Billings & Spencer.

HAMMERS—STEAM—FORGING.

1—400-lb. Toledo.
1 400-lb. Zeh & Hahnemann.
1-New 600-lb. Bell.
1—New 3,000-lb. Bell, September delivery.

KEYSEATERS.

1 No. 00 Baker Bros.
2—No. 0 Mitts & Merrill.
1-No. 2 Mitts & Merrill, motor driven.
1—60" stroke Compton Knowles Broacher.

LATHES—ENGINE.

1 14" x 6' Bradford, taper attachment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1 16" x 6' LeBlond, quick-change gears.
1 New 17" x 8' National, taper attachment
1—18" x 8' L. & S., geared head, taper.
9 18" x 8' American, geared head
3-18" x 9' Chard.
1—New 19" x 8' LeBlond, heavy duty.
1-20" x 16' Greaves-Klusman, taper attachment.
3—22" x 10' Davis.
9 22" x 10' Putnam, oil pan, turrets.
1 24" x 10' Reed.
2 24' x 12' S. & B.
1 24" x 14' Lodge & Shipley, patent head.
4-24" x 14' American, quick-change.
3 New 26" x 12' Boye & Emes.
1 26" x 24' New Haven.
4 New 28" x 12' Boye & Emes.
1 28" x 18' S. & B.
5 New 30" x 14' Boye & Emes.
3 New 32" x 12' Pittsburg pattern.
1—36" x 15' Fifield, 36 x 16".
2 New 36" x 18' Putnam, triple geared.
12 New 36" x 24' Putnam, triple geared.
1—25"-45" x 22' McCabe, double spindle.
1 New 66" x 30' Putnam, Dec. delivery.
1 71" x 20' Fifie'd, triple geared.

LATHES — MANUFACTURING — NOT SCREW WCUTTING.

3 No. 1X Reed-Prentice, semi-automatic.
2—No. 2X Reed-Prentice, semi-automatic.
13—No. 3X Reed-Prentice, semi-automatic.
6 No. 11 Amalgamated, for machining and profiling 5" shells.
6-14" x 6' Reed Stud and Bolt.
3 18" Reed Grooving and Undercutting.
70-New Simplex, 16" x 8'.
22—18" x 8' Battle Creek, heavy duty.
5 20" x 8' Merschon.
5 20" x 10' Hindman, high duty.
12 21" x 8' LeBlond, quick-change with attachment for grooving and facing both ends of shells with air cylinders and mandrels for 5" shells.
18-3½" x 60" Fitchburg, Lo-swing.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

2 New No. 1 Kempsmith.
1 No. 1½ Garvin.
1 No. 1½ Hendey-Norton.
1 No. 2A Kearney & Trecker, single pulley drive.
1 No. 2 Hendey-Norton.
3—No. 2½ LeBlond, Sept. delivery.
2—No. 3H LeBlond, Sept. delivery.
1—No. 3 Cincinnati, single pulley drive, high power, vertical attachment.
1 New No. 1 LeBlond Heavy Duty, immediate.

MILLING MACHINES—KNEE TYPE—PLAIN.

1 No. 14 Garvin.
1—No. 21 Garvin.
1 No. 0 Pratt & Whitney
3 New No. 1 Rockford
2 New No. 1 Kempsmith.
1 New No. 2 Rockford.
1—No. 3 LeBlond.
1—No. 3 Hendey Norton.

MILLING MACHINES—VERTICAL.

3—New Bristol, 10" x 28" table, 21" power feed.
1 New No. 4B Becker.
2 No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 1 Beaman & Smith, two vertical spindles, working surface of table 72" x 14".
1—No. 1 Beaman & Smith, combined vertical and horizontal, working surface of table 72" x 18".
1—Beaman & Smith Slab Miller and Shaft Keyseater, with vertical routing attachment, working surface of table 96" x 17".
2—Ingersoll-Rand Slab Millers, working surface of table 60" x 20".
2—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 21", removable housing on one side.
1—Ingersoll Single Spindle, side head, motor driven, table 96" x 30", cutter head 30" in diameter.

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NEW YORK CITY Singer Bldg.

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When writing ask about our special term plan.

1 9 x 7 New Ohio Toolroom Lathe, with taper attachment and pump and taper attachment.
1 New Toolroom Lathe.
1 New Reversing Hercules Lathe.
1 Used 20 x 9 Modern Geared Lathe, 1 blow spindle, compound rest, cabinet legs; fine condition.
2 New Used Rapid Lathes, Engine Lathes quick change gear, double back gear, compact legs, in fine condition.
1 New 14 Warner Turret Lathe, Hexagon friction geared head.
1 New 22 x 8 Quick Change Lathe, quick change gear, oil pan and pump and taper attachment.
1 7 x 9 Double Spindle Jones & Lamson Lathe; good as new.

OUR SPECIAL BARGAIN—1—16" Plain Shaper with vise and countershaft.

1 [illegible] Punch Press, back head.
1 20" Back Geared Crank Motion Shaper, first class condition.
1 20" Bertram Heavy Duty Shaper.
1 Heavy Single Spindle Post Drill, 4" [illegible] back [illegible].
1—20" Bertram Drill Press.
1 20" Sensitive Hand Belt Drill Press, fine condition.
1 New Electric Sensitive Drill Presses, with square and round table.
1—Niagara new No. 6 Half Automatic Machine.
1—Dominion Universal Grinder.
1—Used Wells Universal Grinder.

DOMINION MACHINERY COMPANY

Office, 110 Church Street - Toronto, Ontario, Canada
Warehouse, 14 Darling Ave Phone Main 6519

Rebuilt Machines For Sale

PLANERS

1 Sellers 24x24x6' [illegible]
1 Sellers 28x30"
2—Sellers 18x30"
1 Putnam 24x24x6'.
1 Putnam 28x30x9'.
1—Wheeler Heavy 30x30"x8' 6".
1—Lathe-Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1 Wood Planer [illegible]
1—Putnam 42x40x12' 6".

GRINDERS

1 LeBlond Universal Tool and Cutter Grinder, [illegible] new.
1 Bridgeport Plain Grinder, [illegible]
1 No. 1 LeBlond Universal Grinder.
1 No. 0 LeBlond Universal Grinder.
2 No. 2X Universal Tool Grinders.
1 Pratt Shank Plain Grinder.

AUTOMATICS

1—1" National Acme Double Belt Type.
1—1½" National Acme Double Belt Type.
1 No. 55 National Acme.
1 1" National Acme [illegible] spindle.
2 No. 4 National Acme [illegible] spindle.
1 2" Cleveland.
1 2½" Cleveland.
2—2¾" Gridley Single Spindle Motors.
1 3½" Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
1 36x22" Flather Lathe, C.R., P.C.F.
1—30x8' Fitchburg, C.R., P.C.F.
3—16x8 Putnam, C.R., taper.
1 18x8 Putnam, C.R., quick taper.
1 18x8 Davis, C.R., pan pump, taper.
10—16x8 Greaves-Klusman, C.R., pan pump.
9—20x6 Perkins Plain Turning, pan, pump.
1—14x6 Porter, C.R.
1—20x8 LeBlonde, C.R.
1—13x5 Seneca Falls, C.R., pan.
14 26x6' Perkins Lathes [illegible] chuck Fay & Scott turrets.

MISCELLANEOUS.

Kempsmith Plain Miller same as new.
1 9" Independent Work Shifter.
1 24" Victor Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
1 [illegible] 4" Drills.
1—Western Hydraulic Banding Machine.
1 Jones Ratel Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1 32" Bement Travelling Head Shaper.
1 32" Jones Geared Crank Shaper.
1 24" Putnam Wheel Lathe, double quartering.
1—Sellers Slab Miller, 24x21x12'.
1—No. 21 Lee-Simplex Saw.

This is only partial list—Send for full list

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(Partial List)

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16' Dunkirk

HAMMERS

10,000 lb. Sellers double leg Steam
5,000 lb. Sellers double leg Steam
Two 5,000 lb. Bement double leg Steam
2,000 lb. Morgan Steam Drop
1,800 lb. Billings & Spencer single leg Steam
Three 1,200 Billings & Spencer Board Drop
1,100 lb. Miles-Bement single leg Steam
1,000 lb. Pratt & Whitney Board Drop
800 lb. Pratt & Whitney Board Drop Forging
750 lb. Toledo Rope Drop
Two 600 lb. Niles-Bement-Pond Co. single frame Steam
400 lb. Bement Steam (new)
200 lb. Bradley Upright Compact
200 lb. Bradley Upright Strap
100 lb. Niles-Bement-Pond Hand Drop
Two 60 lb. Bradley Cushioned Helve
40 lb. Bradley Cushioned Helve
40 lb. Gould & Eberhardt Hand Rope Drop (4)

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive
No. 4 Brown & Sharpe Plain
No. 4 Cincinnati Plain, heavy duty, single pulley drive
No. 2 Hendey-Norton Universal
No. 2 Cincinnati Universal
No. 2 Cincinnati Plain
New No. 1½ American Improved Plain
No. 1 Kempsmith Plain
No. 1 Pratt & Whitney Plain
No. 3½ Garvin Plain, table 12" x 36"
Beaman & Smith 2 spindle Vertical, table 24" x 48"

BORING MILLS

Two 20" Bullard Vertical Turret Lathes
Three 34" Rogers Vertical, single turret head
Five 30" Bullard Vertical, single turret head
Pratt & Whitney Horizontal, 2¼" bar
48" Niles Car Wheel
45" Putnam Vertical Car Wheel, facing attachment
Underwood Automobile Cylinder, 3⅝" bar

New York Machinery Exchange, Inc.

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IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S.B.B., Bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
22" Barnes, s.h., b.g., p.f., tapping attach.
No. 25 Foote-Burt 24" Drill (new).
32" Hamilton s.h., b.g., p.f.
34" W. F. & J. Barnes, S.H., B.G., P.F.
12-spindle Multiple P. and W.
No. 30-C Baush, 12-spindle.
20" W. F. & J. Barnes, 4-spindle.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. Automatic.
30" x 9" G. & E. Auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3 26" B. & S., for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 5 Diamond Water Tool.
No. 16 Gardner Disc Grinder.

LATHES

No. 3½ Rivet.
No. 3 Cataract.
No. 5 Cataract.
13" x 5' P. & W. c.r. taper.
14" x 6' Davis, p.r.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
16" x 6' Bradford, c.r., q.c.g.
18" x 8' L. & S., pat. head, c.r. taper.
18" x 10' Fitchburg, c.r
18" x 12' Barker, c.r.
20" x 14' Blaisdell, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdell, c.r.
36" x 20' American, t.b.g.
31½" x 60" Fitchburg Lo-Swing.

PLANERS.

30" x 30" x 8' Lodge & Davis, one head.
36" x 36" x 12' Powell, single head, arranged for two.
36" x 36" x 16' Sellers, one head.
36" x 36" x 12' Chandler, two heads, one side head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.

SCREW MACHINES.

1" B. & S., Plain.
16" P. & W., Plain.
No. 2 Foster, Plain Head.
No. 2 Costello, Plain Head.
No. 2 P. & W., Friction Head.
No. 3 Foster, Geared Head.
No. 1 Pearson, Geared Head.
No. 3 Bardons & Oliver, Plain Head.
No. 12½ Garvin, Friction Head.
No. 2-G B. & S. Automatic.
2" Cleveland Automatic.
⅞" Cleveland Automatic.
2¼" x 11" Acme (4).
No. 6 Warner & Swasey (3).

TURRET LATHES.

16" Garvin Friction Head, a.c. and w.f.
16" Lodge & Shipley.
25' Niles.
No 2 Warner & Swasey, Hollow Hexagon.
2" x 24" Jones & Lamson.
3" x 36" Jones & Lamson, chucking equipment.
3" x 36" Jones & Lamson, bar equipment.
3" x 36" Jones & Lamson, Double Spindle.
21" Gisholt, with taper.
2—24" Gisholt Turret Lathes, taper attach.

MISCELLANEOUS.

¾" Acme Forging Machine.
52" Niles Car Wheel Boring Mill.
No. 1 Davis Keyseater.
No. 2 M. & M. Keyseater.
No. 3 M. & M. Keyseater.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 3A La Point Broacher.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-Ton Yale Duplex Hoist.
3-Ton Yale Triplex Hoist.

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HORIZONTAL BORING MACHINES.

1 Binsse, 3" bar.
1—Newark, 3" bar.
1—Betts, 2⅞" bar.
1 No. 5 Schuchardt & Schutte
1—Bement, 2⅞" bar.
1 Beaman & Smith, 2½" bar.
1—No. 4 Newton, 2-spindle
1—Beaman & Smith 2-Spindle Cylinder Borer.

MILLING MACHINES.

1—No. 3 Hendey.
1—No. 2 Cincinnati Univ.
1 No. 20 Osterlein Univ.
1 No. 25 Becker.
1—No. 0-Y Brown & Sharpe.
1 60" x 54" x 8' Ingersol Slab.
1—92" x 72" x 15' Beaman & Smith Slab.
1—No. 2 Beaman & Smith Horiz. and Vert.
1—Hilles & Jones Vertical.
1—No. 6 Becker Brainard Vert.

PLANERS.

1—32" x 32" x 10' Gray.
1—32" x 32" x 8' Gray.
1—30" x 30" x 10' Powell.
1—26" x 26" x 6' American.
1—26" x 26" x 7' Gray.
1—24" x 24" x 10' Lodge & Davis.
1—24" x 24" x 6' Cincinnati.
1—24" x 24" x 6' Gray.
1—24" x 24" x 5' Gray.
1—24" x 24" x 4' Gray.
1—23" x 23" x 5' Flather.
1—22" x 22" x 6' American.

LARGE LATHES.

1—42" x 18' Draper.
11—40" x 16' Pittsburgh.
1—36" x 16' Springfield.
1—32" x 14' New Haven.
1—31" x 14' Pond.
1—31" x 12' Pond.
3—30" x 16' Lodge & Shipley.
5—28" x 14' Lodge & Shipley.
10—28" x 10' Pond.
28—26" x 12' Putnam.
1—26" x 12' Schumacher & Boye.
2—26" x 12' Wickes.
13—26" x 10' American.

Each Machine Is:

1. **Completely Disassembled.**
   Even if practically new they are completely disassembled, thoroughly cleaned, flat surfaces tested out with straight edges or surface plates.
2. **Flat Surfaces are Hand Scraped to Brown & Sharpe Surface Plates.**
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3. **Bearings Re-Aligned.**
   Cylindrical bearings are where necessary, renewed and then aligned by the aid of precision instruments.
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   Adjustments are carefully made under the supervision of five competent foremen and an expert superintendent.
6. **Tested Under Belt.**
   Each machine is tested under belt both for **Operation** and **Accuracy** before it leaves our plant so that we are confident that it is ready to go to work when you get it.
7. **Covered By Our Broad Guarantee.**
   You may choose a machine not suited to your work or your work may change after receiving the machine. Again we may list a machine incorrectly or something may have been "put over" our shop inspectors. Therefore, for your protection we give just one guarantee which covers everything, your mistake or ours, *i.e.*—**if a machine is not suited for your work, if it disappoints you in any way send it back within thirty days from date of shipment, freight prepaid, and we will cheerfully refund your purchase price in full.** *Fair enough, isn't it?*

IN CHICAGO
The Great Machinery Center

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1—26" x 10' Prentice.
1—24" x 14' Blaisdell.
1—24" x 12' Draper.
1—24" x 10' New Haven.
16—24" x 10' Lodge & Shipley.
1—22" x 16' Flather.
1—22" x 10' Schumacher & Boye.
1—22" x 10' Reed.
20—22" x 10' Davis.
38—22" x 8' Hamilton.
4—22" x 8' Davenport
1—22" x 8' Lodge & Shipley.

LARGE TURRET LATHES.

1 No. 3-A Warner & Swasey.
99 24" Gisholt.
52—21" Gisholt.
1—22" Libby.
1—No. 6 Bardons & Oliver.
1—No. 6 Foster.
3—2" Gridley.
1—2" x 26" Pratt & Whitney G. H.
1—3" x 36" Pratt & Whitney.
2—2¼" x 26" Greenlee.
2—2" x 24" Jones & Lamson G. H.
3—2" x 24" Jones & Lamson Cone.

RADIAL DRILLS.

3—5' Niles Semi-Univ.
1—4' Niles Full Univ.
1—3½' Gang.
1—3' Prentice.
1—3' Mueller.
1—2½' Dreses.
4—2½' Fosdick.
2—2½' Mueller.

MISCELLANEOUS.

3—8" Nutter Barnes Cold Saws.
2—72" Bickford Vertical Boring Mills.
1—42" Betts Car Wheel Borer.
1—84" Poole Vertical Boring Mill.
3—No. 73½ Bliss Presses.
1—No. 23½B Niagara Toggle Press.
1 36" Gleason Spur and Bevel Gear Former.
1 1½" Morton Keyseater.
1—10" Bement Slotter.
2—No. 14 Brown & Sharpe Plain Grinders.
1—Gleason Gear Planer, 84" bevel, 96" spur.
1—48" Morton Draw-cut Shaper.

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Designers and Builders of Special and Automatic Machinery. Experimental and Metal Pattern Work. Electric Welding Machinery. Wire Forming Machinery.

SEE PAGE 78

HIGH CARBON STRUCTURAL

STEEL TUBING

BUTTED & BRAZED
BENDS & SHAPES

SHEET METAL STAMPINGS

CANADIAN METAL PRODUCTS, Limited,
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An advertisement in this section will put you in touch with firms who have the facilities for handling small stampings, small tools, jigs, fixtures, etc. If you need their help, tell them so here.

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Contract Work Section
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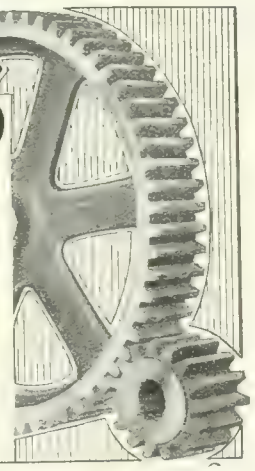

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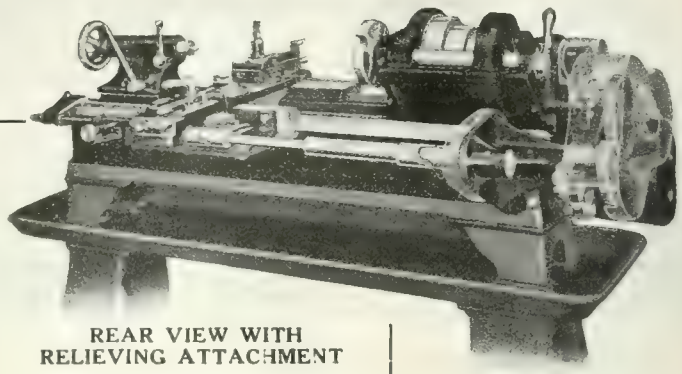

REAR VIEW WITH RELIEVING ATTACHMENT

A QUICK-CHANGE lathe from 12" to 14" swing with a 4-5 or 6' bed, 8-1 and 10-1 gear ratio; 1¾" and 2" belt; 15-16" hole in spindle 6-320 feeds; 17½" carriage 40" between centres; these are a few of the specifications that will give you an idea of the capacity of the machine.

Its construction is such as to conform to the most rigid inspection. For precision work it is ideal. Specially designed tumbler gears insure smooth and quiet running. There is no clashing when the gears engage, this feature lengthens the life of the machine.

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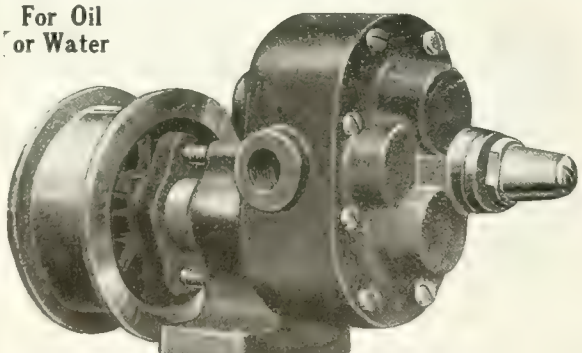

Fig. 1850—With Automatic Relief Valve

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if you wish it, or just enough to cool the tool —whichever you prefer. That is the way TRAHERN ROTARY GEARED PUMPS deliver the lubricant. Don't delay another day—write at once.

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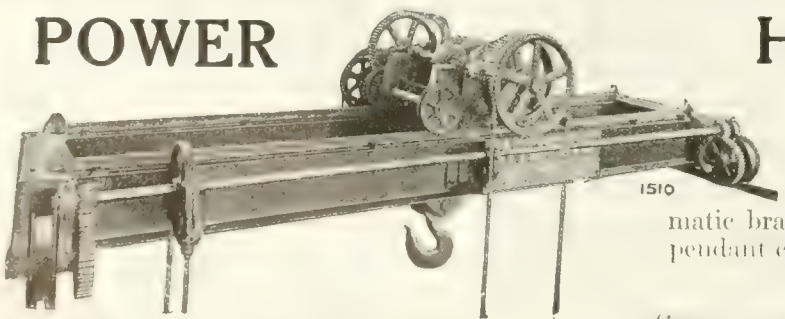

Our "Rope-Drum Hoist" crane illustrated here is especially useful in power houses, a large number being in service to-day. Two speeds; automatic brake; all movements operated from floor by pendant chains.

Complete Foundry Equipments

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are doing more than their bit in the shops and foundries. They are preventing millions of accidents daily in the largest plants of Canada, United States and England.

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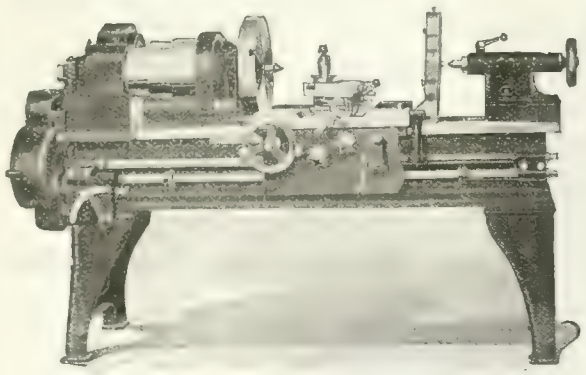

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15" x 8' Giddings & Lewis Standard Engine Lathes.
Three Step Cone.
Double Back Gears.
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Dimensions:
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4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.

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More Speed—Less Breakage—and Efficient Work.

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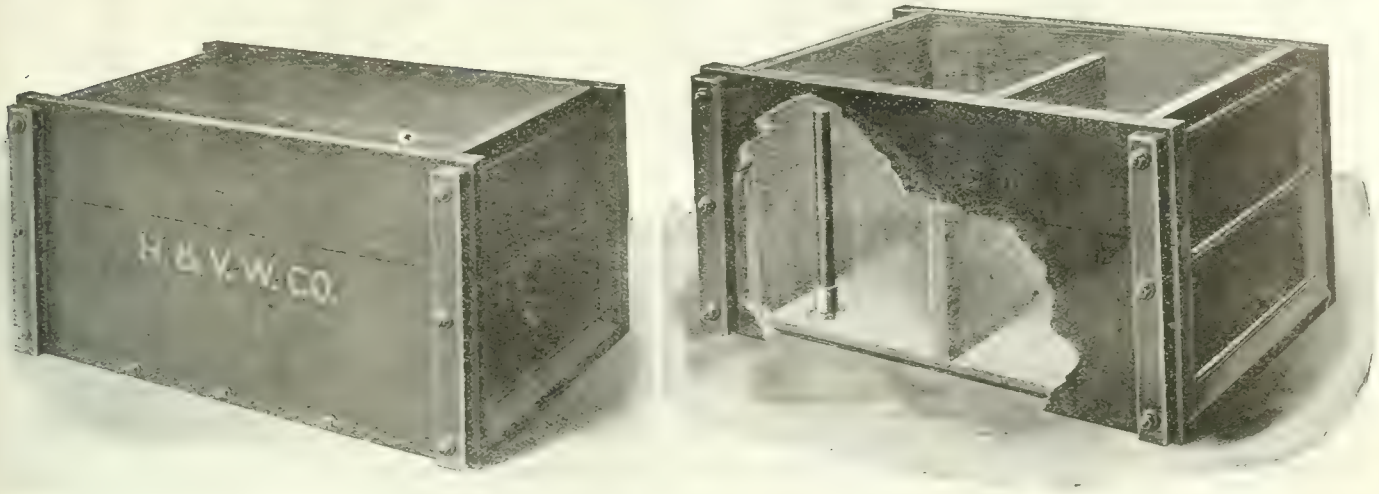
WOOD and STEEL TANKS



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High Speed Steel HOISTS

PROVEN ABILITY

In munition shops, where speed is at the highest stage of development, in construction and engineering plants, in manufacturing concerns the Wright High Speed Steel Hoists have proven their ability. In one munition shop 70 Wright Hoists are installed.

The "never break" feature has instilled confidence into all its users.

Of steel and malleable iron construction, these hoists have a capacity and long life that make them a constant profit-maker.

The **non-fouling chain guide** promotes efficiency and is distinctly a Wright feature.

Our catalogue and services are at your immediate disposal. "Write Wright's" right away.

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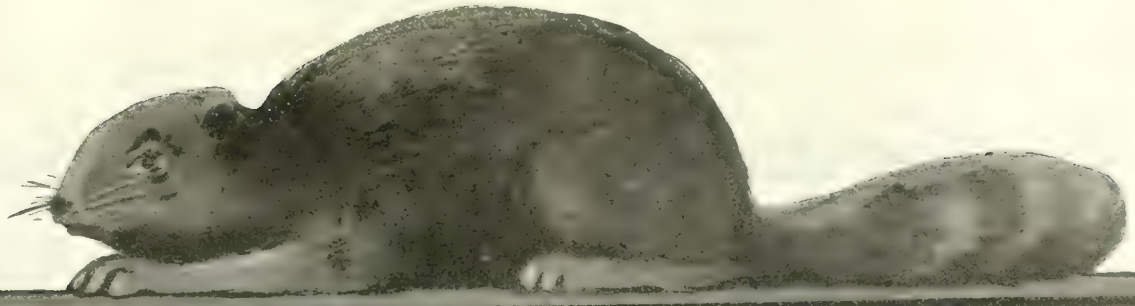

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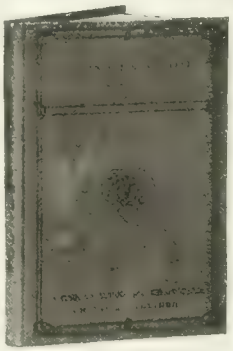

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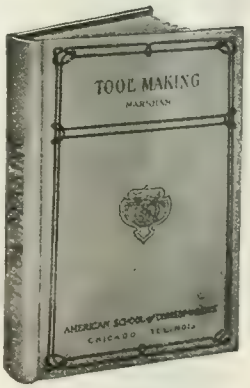

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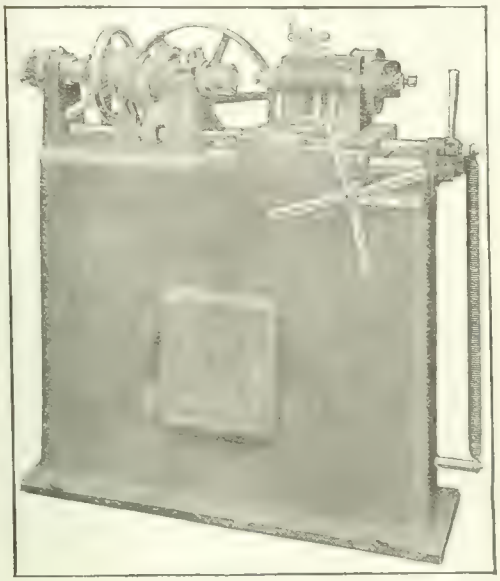

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Will not soil or streak. 12 SIZES. FROM 100 TO BOX, TO 4 TO BOX. BOX PRICE $2.00

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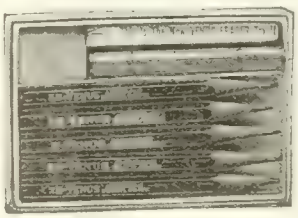
This test box of VENUS drawing pencils, VENUS copying pencil and VENUS Erasers FREE.



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American Lead Pencil Co.
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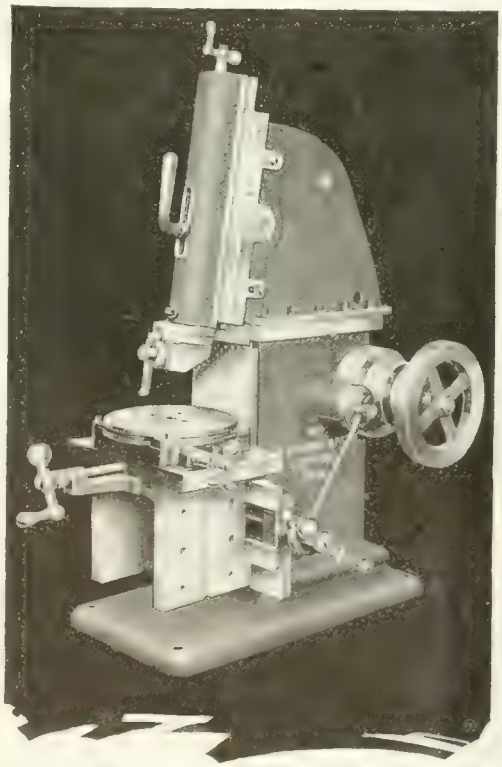
Rhodes Combined

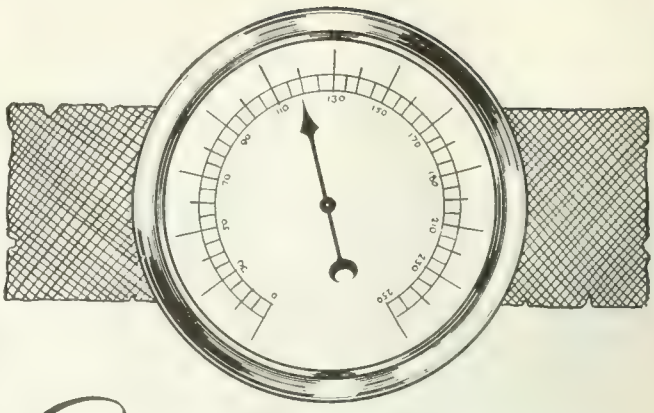
Shaper and Slotter

Light-running, easy to handle — far more efficient than heavier and complicated tools. Lead in every way for light and thoroughy accurate work. They're saving production costs in all parts of the world.



Maximum efficiency at minimum cost is the Rhodes slogan—and it's true. Illustration shows 3½ in. bench type vertical crank shaper. Let us tell you fully of all various types.

THE RHODES MFG. COMPANY
HARTFORD, CONN., U.S.A.



Can you keep the pointer where it belongs?

It's getting near four o'clock. The demand for power is a trifle heavier than usual. The peak is coming. The sockets click one after another in a steady stream. The demand for steam is going up, up, up. Can You Keep The Pointer Where It Belongs?

Sturtevant
(TRADE-MARK)

Turbo-Undergrate Blower

will keep steam up. It supplies all the draft you want and just when you want it.

When you buy a blower be sure it's a Sturtevant. The Sturtevant name is a guarantee of mechanical excellence—a guarantee that you will have no breakdown and no bearing trouble. The Sturtevant Set has generous bearings with oil rings and large reservoirs. One filling will last for weeks.

To prevent the escape of steam from the casing there is a floating stuffing box. If for any reason through neglect or carelessness this is allowed to leak, there is a special "water-throw" collar which makes it impossible for steam to enter the bearings. Furthermore, the floating stuffing box makes it possible to exhaust against back pressures as high as 25 pounds.

If you have trouble getting enough steam or keeping the needle where it belongs, write us for bulletin No. 214-U.

B. F. STURTEVANT COMPANY
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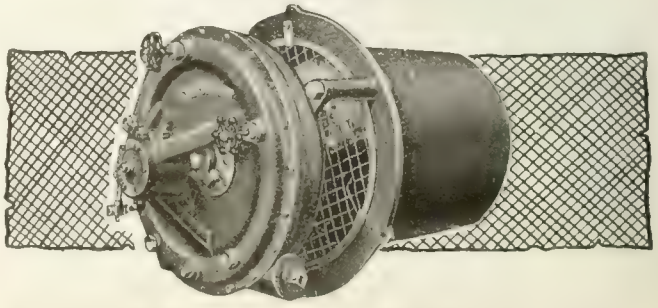

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Are you interested in making a superior article at a substantial reduction in cost?

We want an opportunity to show you how it can be done. Just tell us what you make. Perhaps you can send us a blue-print or a sketch. Our proposition with facts and figures come back in the next mail.

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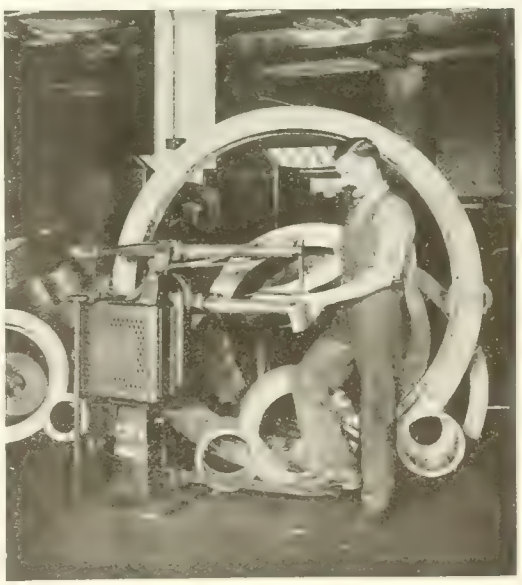
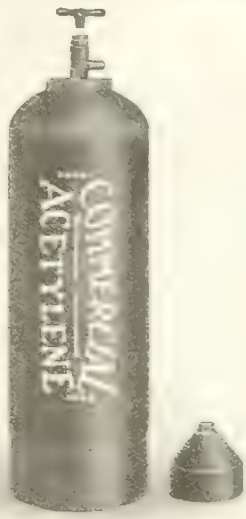
Manufacturers of

"The Complete Line of Electric Welders"

Perhaps you operate a job shop, and have occasion to rivet all kinds of odd shapes and sizes. An electric welder is indispensable in your work. With it one man can spot-weld more work than ten men can rivet, and do it better too. Does that appeal to you? If it does, investigate. It's no trouble to furnish facts that convince.





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Manifold of

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OXY-ACETYLENE PROCESS

Oxy-Acetylene Welding is now the method universally adopted for joining metals in all Industries where the highest efficiency is essential—simplifying many manufacturing processes—improving the product—reducing the cost. The tensile strength of the Oxy-Acetylene welded joint being approximately the same as the metal itself.

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Oxy-Acetylene Welding and Cutting Equipment and Supplies of the highest efficiency and of proven merit, backed by Service; manufacturing in Canada the Purest Oxygen and Dissolved Acetylene Gases. Maintaining three factories and a staff of experts, at your service; ready at all times to advise and instruct to ensure your complete satisfaction. You have many uses for it and it will save you money.

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A portable Oxy-Acetylene Welding and Cutting Equipment operated instantly in conjunction with Oxygen and Acetylene Gases, and weighing less than 300 lbs. Ready at all times, wherever required, to repair, reconstruct, or render equal to new any broken casting, machine part, etc. To permanently join two pieces of metal for whatever purpose, at a lower cost, in less time and more effectively than by any other method.

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National

Electric Welder

Make a New Set of Tools

The short stubs of High Speed Steel bits you have been throwing in the scrap box, if welded to a low carbon shank or holder, will make a better tool than it originally was.

"It's stronger and has greater radiating surface, and consequently will cut faster."

Write for our free booklet on "Saving High Speed Tool Steel."

If you are interested in metal working there is some electric welder in our line which you need. Get in touch with our nearest agency.

The National Electric Welder Company

WARREN - - - OHIO - - - U. S. A.

Represented by The A. R. Williams Machinery Co.
64 Front Street West, Toronto, Canada

The Growth of Oxy-Acetylene Welding and Cutting and the Increasing Demand for Davis-Bournonville Apparatus

A Year Ago we said—

"The growth of Oxy-Acetylene Welding and Cutting in the United States is shown by the increasing use of Davis-Bournonville apparatus, which is inseparably associated with the development and success of the oxy-acetylene industry in this country.

"Ten years ago the process was unknown in the United States. To-day it forms one of the great industries of the country, with its requirements for acetylene, oxygen and efficient apparatus.

"The Davis-Bournonville Company obtained the United States patents for the independent positive-pressure type of welding torch (mixing the gases in an interchangeable tip or nozzle) in 1906—basic principles which have been retained in the D-B torch because of their proven superiority through ten years of development, improvement and the most successful operation.

"There is more Davis-Bournonville welding and cutting apparatus in successful use in the United States than of any other make, and the prominent concerns which have established the greatest success with this process have large installations of D-B apparatus, with from ten to one hundred or more torch units, and from one to six of the largest acetylene generators."

Today—The increasing use of the oxy-acetylene process for welding and cutting and of Davis-Bournonville apparatus are parallel and are graphically shown by the sales of "Davis Apparatus" as charted below:

"Davis Apparatus" Leads the World in Range, Efficiency and Number of Successful Users. Write for bulletins and information showing why it is used by the largest steel mills, foundries, ship-yards, locomotive and car builders, U. S. Navy Yards and government works, mines, sheet metal working factories, tube and barrel welders, scrap yards, and in hundreds of small repair shops and garages.

DAVIS-BOURNONVILLE COMPANY

General Offices and Factory, JERSEY CITY, N. J.

CARTER WELDING COMPANY, *GENERAL DEALERS* TORONTO

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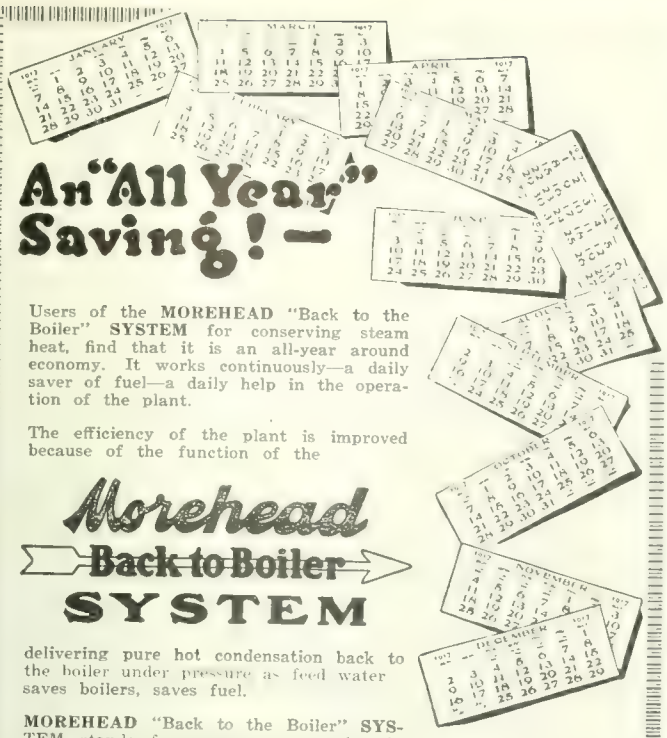

An "All Year" Saving!—

Users of the MOREHEAD "Back to the Boiler" SYSTEM for conserving steam heat, find that it is an all-year around economy. It works continuously—a daily saver of fuel—a daily help in the operation of the plant.

The efficiency of the plant is improved because of the function of the

Morehead
Back to Boiler
SYSTEM

delivering pure hot condensation back to the boiler under pressure as feed water saves boilers, saves fuel.

MOREHEAD "Back to the Boiler" SYSTEM stands for economy every day in the year.

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420

Economic Boiler Compound

If you have boiler troubles, and wish to clean same at a minimum cost, use ECONOMIC BOILER COMPOUND, it will surprise you.

Manufactured by

CANADIAN ECONOMIC LUBRICANT CO., LTD.

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Medal of Honor, Highest Award, Panama Exposition. Made in Canada.

Why Use Compressed Acetylene

when you can generate your own acetylene at 50% less cost and always have ample gas on hand?

Davis Acetylene Pressure Generators

Made in three types, the standard pressure generator in five sizes, with capacity of 25 lbs., 50 lbs., 100, 200 and 300 lbs. of carbide at each filling.—the portable pressure generator in 25 lb. and 50 lb. capacity sizes,—and the Navy Type two pressure generator with capacities of 100 lbs., 200 lbs., or 300 lbs. All pressure generators supply acetylene under pressure up to 15 lbs. The Davis acetylene generator is on the approved list of the National Board of Fire Underwriters. Patented.

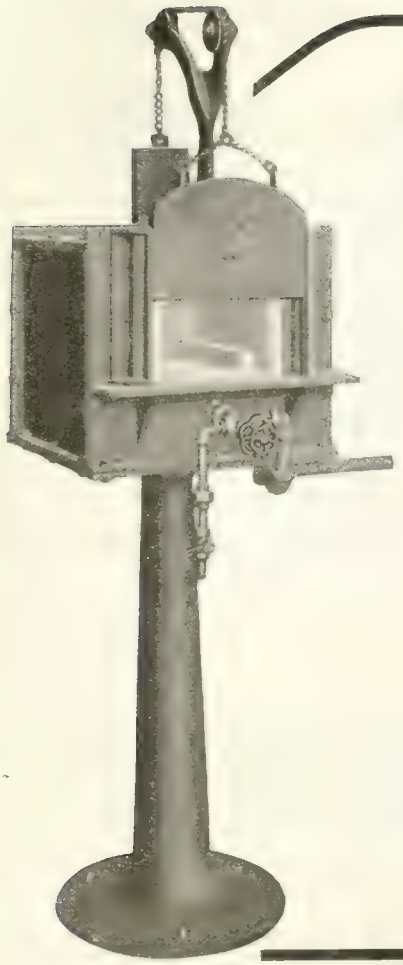
Generators of all sizes kept in stock.
Prices and Catalog on request.

Carter Welding Company, Limited

9-11 Sheppard Street **Toronto, Ontario**

Canadian Agents for
THE DAVIS-BOURNONVILLE APPARATUS

If any advertisement interests you, tear it out now and place with letters to be answered.



BELLEVUE FURNACES

For General Tool Work

OIL or GAS

These tool Forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

For General Shop Work these furnaces are of the greatest service. They are made to stand the highest temperature that may be required. Constructed in the strongest possible nature, with doors properly counter-balanced.

When operated with oil or gas (manufactured or natural), an intense heat is rapidly developed and remains under accurate control. Combustion is perfect and no flames come in contact with the material.

With the use of these furnaces the highest class of work can be uniformly depended on.

Write for our Catalogue showing our complete line of Furnaces.

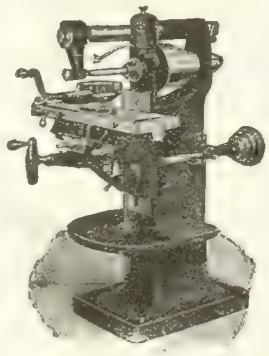
Bellevue Industrial Furnace Company

Julius C. Hinz, President

703 Bellevue Ave., - - Detroit, Mich.

Representatives in Canada: H. W. Petrie, Ltd., Toronto, Canada

Don't Crowd Your Large Machines

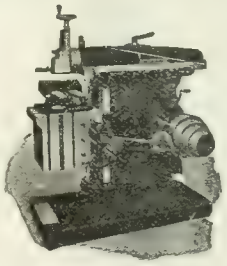


You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

STEPTOE SHAPERS "Just a Little Better."

CIRCULAR ON REQUEST.



John Steptoe Co., Cumminsville, Cincinnati, Ohio, U.S.A.

SHEET METAL STAMPINGS

Dominion Forge & Stamping Co., Limited

WALKERVILLE ONTARIO

DROP FORGINGS

Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS

Tate-Jones

HEAT TREATING FURNACES

TATE-JONES Circular Semi-Muffle Furnaces, as illustrated above, have been widely adopted by shrapnel makers because of their rapidity, uniformity and convenience of operation.

Proper heating is easily and safely accomplished in furnaces of this type.

There are numerous complex problems met in the manufacture of heat-treating furnaces—but years of experience, scientific research, unlimited tests and intimate association with all manner of heat-treating processes have enabled us to cope successfully with all difficulties. When you get a Tate-Jones Furnace you can rest assured that you are getting a furnace that will turn out work fast and efficiently.

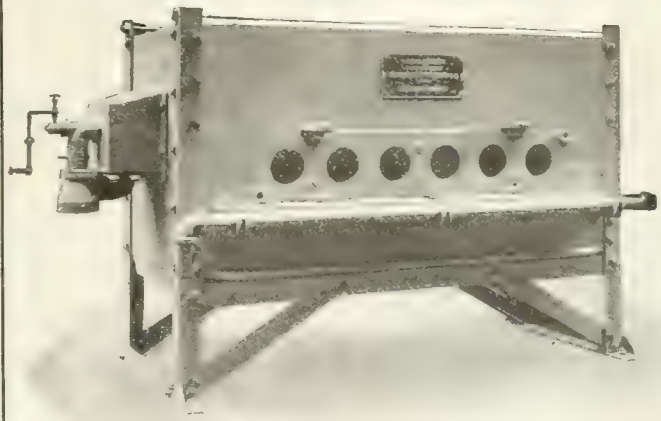
Before placing your next order for furnaces for Annealing, Hardening, Tempering, etc., it will pay you to make the most minute inspection of the Tate-Jones line and compare it with any other on the market.

Send for Catalog, or ask for Bulletin 148-C,
"Shells and Shell Furnaces"

Tate-Jones & Co,, Inc., Pittsburgh, Pa., U.S.A.

FURNACE ENGINEERS

If any advertisement interests you, tear it out now and place with letters to be answered.

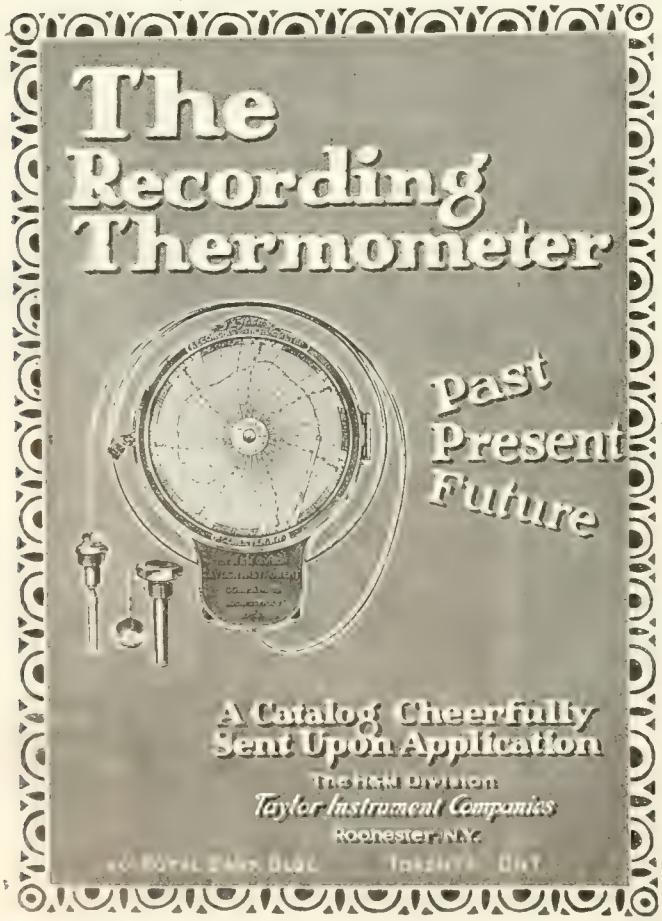


"MECOL"

6" Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

The Mechanical Engineering Company, Ltd.
THREE RIVERS, QUE., CANADA



High Speed Steel Treated at 1750

by pack hardening in HeTzy

a scientifically compounded and thoroughly tested preparation. Yes, and further, you will find that you

1. keep down H/S steel scrap pile,
2. turn out tools with 30 per cent. more production.
3. eliminate distortion, breaking and pitting.

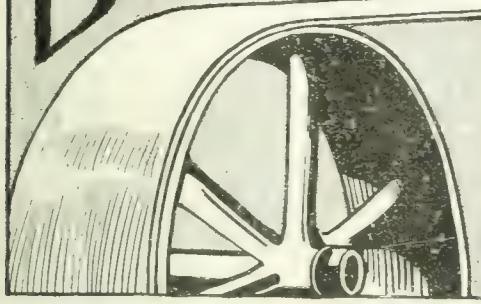
Prove this at our risk.

Send for 100 lb. container and try it for 30 days. If it doesn't do what we say, return the balance and you owe us nothing.

If still in doubt write for our circular and partial list of 200 representative concerns using HeTzy on all H/S treatment.

Gibb Instrument Co.
5716 Euclid Ave., CLEVELAND, OHIO.

Scandinavia Belts



Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market today.

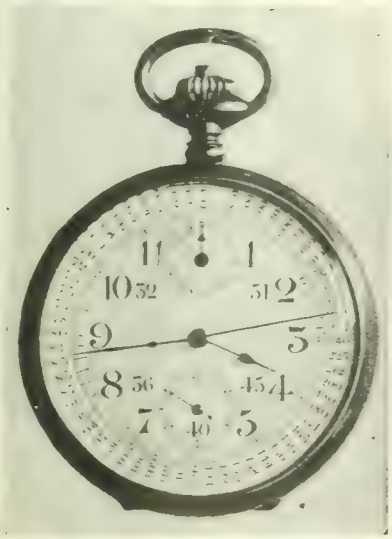
It stands up well on shifters.

W. P. BENNETT
51 Montfort Street, Montreal, P.Q.

Beltings *Packings* *Asbestos*

Determine, Measure and Eliminate

LOST TIME and MOTION



To "economize" on selling expenses may be "to save yourself into poverty."

a reduction of costs.

never sell itself cheaper cost of materials is increasing yearly.

Therefore, increased profits in your plant are dependent upon just on thing:

You must determine, measure and eliminate lost time and motion.

will enable you to de- calculation just what a DOES DO and SHOULD DO in an hour or a minute.

With ... INSTRUCT ... MEASURE ... an added profit without the ...

The Master Cronograph is the one device which will show at a single rating the total of its computation. The only watch that will reduce net time ... It embodies a 17-jewel ...

MORTIMER J. SILBERBERG Engineer
122 So. Michigan Avenue Chicago, Ill.

FOR MUNITION WORKERS

WILLSON SAFETY GLASSES
REG U.S. PAT. OFF.

—Including chippers, grinders, machinists, furnacemen, temperers, and those who work in dust or fumes.

Machinists' and grinders' goggle for light work. Albex Eye Protector (Style A1), $1.25

Ventilated leather sideguards, 1⅞ in. amber or clear lenses, flexible cable earbows or detachable elastic headband, and adjustable bridge. Can be worn over other glasses. Per pair, $1.25. Per dozen, $9.60. Look for the name WILLSON stamped on bridge. Accepted by the United States War Department for military wear. **Send for illustrated price list.**

T. A. Willson & Co., Inc., 23 Scott St., Toronto
Factory and Main Offices: READING, PA., U.S.A.
CHICAGO Mallers Bldg. SAN FRANCISCO Head Bldg LONDON 5 Hatton Garden

---

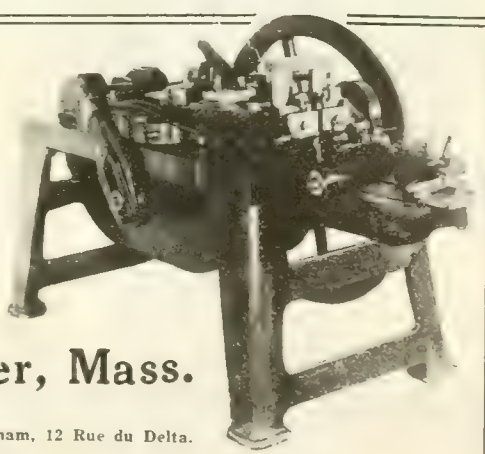
MAKE NAILS! NOT NOISE!

We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built ... handling wire from No. 17 to ...

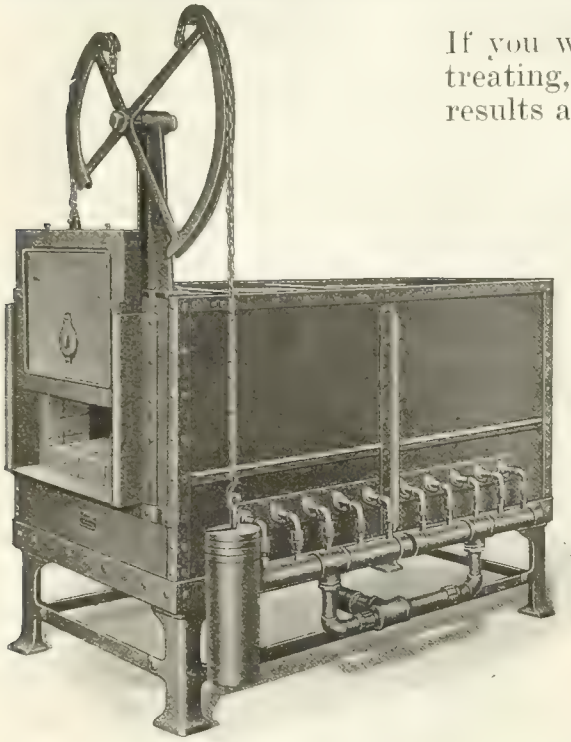


PRACTICALLY NOISELESS IN OPERATION

Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.



TYPE C—25

If you would do away with coal or coke uncertainty in heat-treating, effect a 25% reduction in spoilage costs, obtain uniform results and a product of better quality—it will pay you to thoroughly investigate

GILBERT & BARKER FURNACES

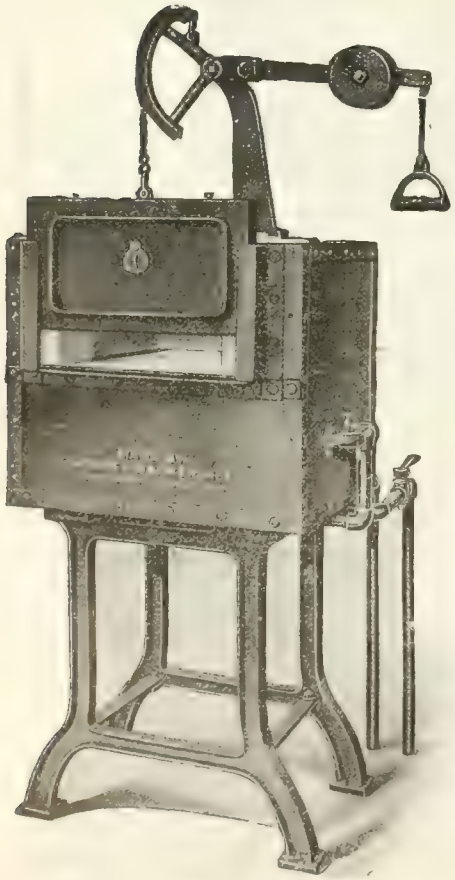
and Low Pressure System of Burning Oil Fuel

TYPE C—15

Fuel waste is eliminated by these furnaces—every unit of heat is utilized. Their oil or gas fires are valve regulated. An ordinary mechanic can keep them steady and even and work continuously, which means uniform heating, and uniform heating is the great secret of success in hardening steel.

Fifty-two years' experience, study and practical experience with gaseous and liquid fuels is behind the manufacturing of more than one hundred types of Gilbert & Barker furnaces. Our line includes furnaces for every need—for forging, welding, lead and cyanide hardening, tempering, bluing, etc., both muffle and semi-muffle types, all made from the best materials.

Put your heat treating problems up to us. We have equipped some of the finest heat treating plants in the world and you may have the benefit of our expert advice without charge.



TYPE C—10
Semi-Muffle Oven Furnace

Just at present we are able to make prompt delivery on many types. Write to-day for your copy of stock list 24.

Gilbert & Barker Mfg. Co.

SPRINGFIELD, MASS.

CANADIAN AGENTS:

Williams & Wilson, Limited, Montreal, Que

James DeVon, 227 Davenport Road, Toronto, Ont.

Why pay 50% more than is necessary for unloading your Pig Iron when you can save that percentage by using MATHEWS GRAVITY PIG IRON CONVEYOR? Write for our Bulletin C.

CANADIAN MATHEWS GRAVITY CARRIER CO., Ltd.
484 RICHMOND STREET W., TORONTO

THE BUHR DRILL HEAD

(Adjustable and Fixed Centres)

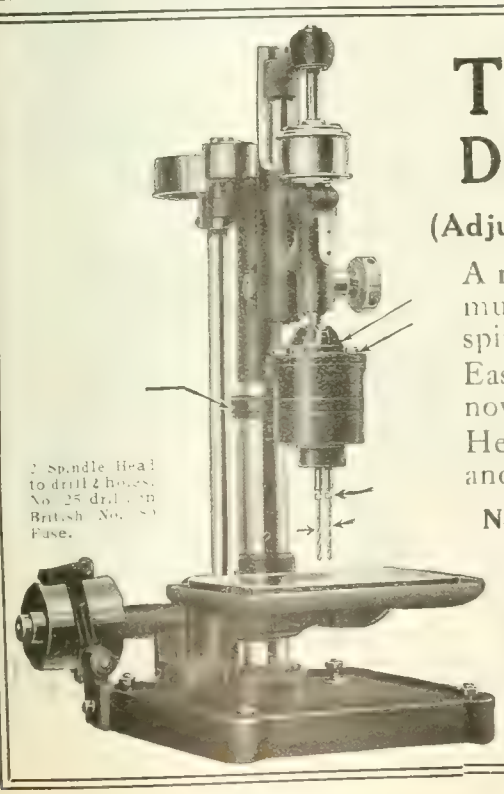
A new and original designed multiple head from 2 to 12 spindles.
Easily attached to any press now on the market.
Heads are furnished in plain and ball bearing.

No Running Hot of Bearings

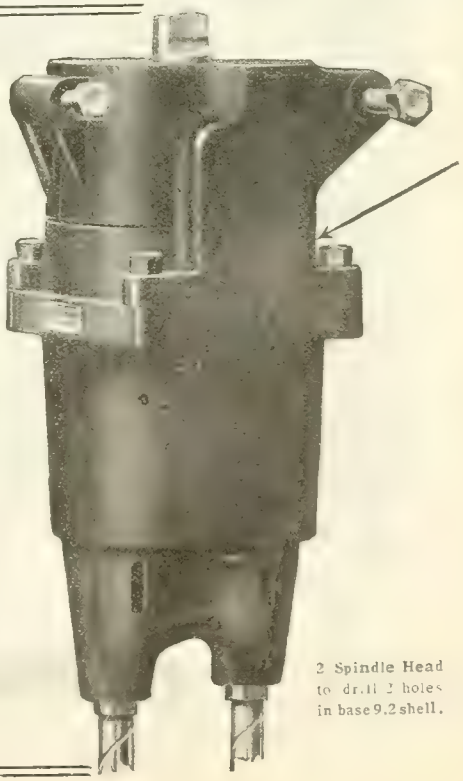
Buhr Ball Bearing Heads need very little care

Write to-day for information.

NELSON-BLANCK MFG. CO.
Detroit, Mich.



2 Spindle Head to drill 2 holes No. 25 drill in British No. 50 Fuse.



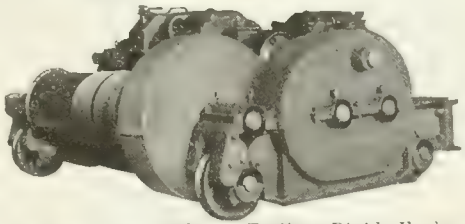
2 Spindle Head to drill 2 holes in base 9.2 shell.

CANADIAN MADE

Electric and Hand Traveling Cranes

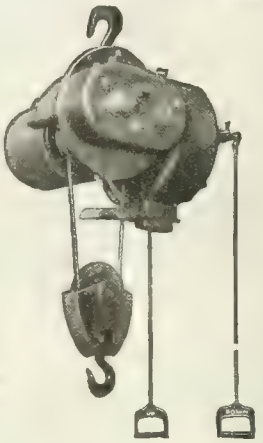
CANADIAN MADE

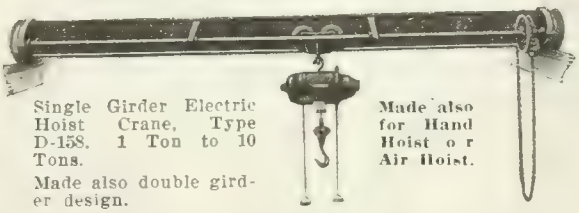
Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.





Single Girder Electric Hoist Crane, Type D-15S. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

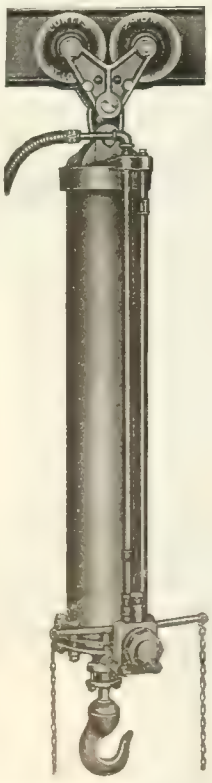
Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

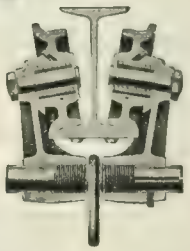
Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada



CURTIS, St. Louis, U.S.A.

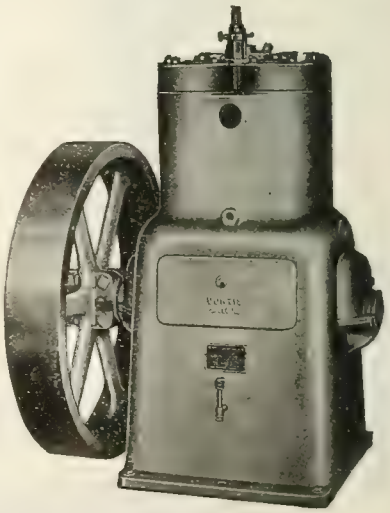


AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

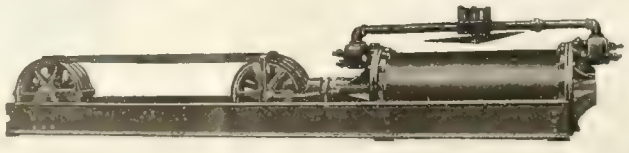
Complete catalogs and descriptive circulars on our entire line furnished on request.



Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.

New York Office - 532F Hudson Terminal



Standard Pressed Steel Company

Philadelphia, Pa., U.S.A.

Sole Distributors for Ontario: H. W. Petrie, Ltd., Toronto, Ont.

If any advertisement interests you, tear it out now and place with letters to be answered.

IN STOCK READY TO SHIP

"STAR BRAND"
SEAMLESS BRASS
CONDENSER TUBES

TINNED INSIDE AND OUTSIDE

5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

—AND—

"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

OUR STOCK ON HAND READY FOR IMMEDIATE SHIPMENT ALSO INCLUDES A FULL LINE OF REGULAR STOCK SIZES AND SHAPES OF THE FOLLOWING

"STAR BRAND" SPECIALTIES

Seamless Brass and Copper Pipe and Tubing, Brass Fittings, Sheet Copper, Copper Bar, Rods and Wire, Copper Nails, Sheet Brass, Brass Rods, Tobin Bronze Rods, Copper Rivets and Burs
AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

U. T. HUNGERFORD BRASS & COPPER CO.

BRANCHES:
BOSTON
BALTIMORE
PHILADELPHIA
SAN FRANCISCO

HUNGERFORD BUILDING
Lafayette, White and Franklin Sts.
NEW YORK, U.S.A.

KINDLY ADDRESS INQUIRIES FOR ATTENTION OF DEPARTMENT D.

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches

"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches

These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

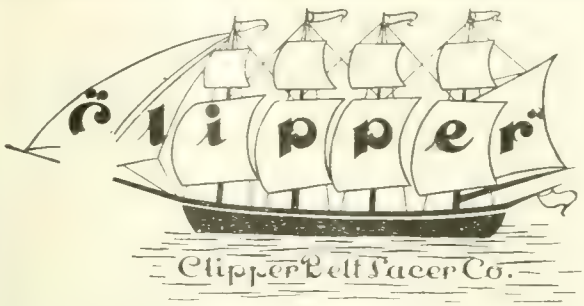
Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 82 on request.

The Whitman & Barnes Manufacturing Company

ESTABLISHED 61 YEARS

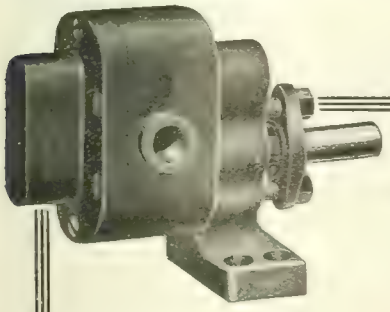
ST. CATHARINES, ONT.



If you would use a stop watch while one of your belt lacing crews were at work you would find that you were paying expert men for a half hour job when any machine operator can lace a belt in THREE minutes with the

CLIPPER BELT LACER

CLIPPER BELT LACER COMPANY
976 Front Ave., N.W. Grand Rapids, Mich.



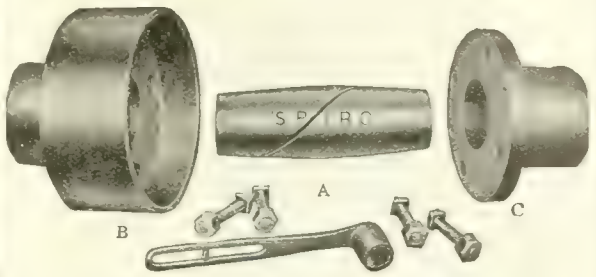
Speed Up—

You can speed up that machine to its highest capacity and rest assured that Roper's Circulating Pump will keep the machine well oiled.

The machine is so constructed that the lubricant will flow in a steady stream, no halting, pulsating movement at all. This is a feature well worthy of notice. The circular is made in 6 sizes and will adjust itself to any size machine. The pump shown is a one-way lubricator only. We make the other kind.

Inquire.

C. F. ROPER & CO.
HOPEDALE : MASS. : U.S.A.



The Bond Patent "Spiro"

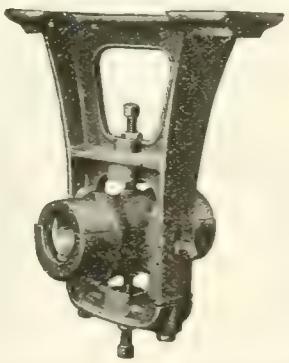
The PRICE is never right if the quality is wrong. QUALITY in Power Transmission Equipment means correct design based on long experience and skill in manufacturing and finishing.

When you buy BOND Transmission machinery, you know the quality is right, for we have had twenty-five years' experience.

And at the same time BOND transmission equipment can be bought at prices as low as are now charged for many inferior lines.

Write to-day for our complete catalogue.

Canadian Bond Hanger & Coupling Co., Limited
Alexandria, Ontario



The Original Four-Point Hanger

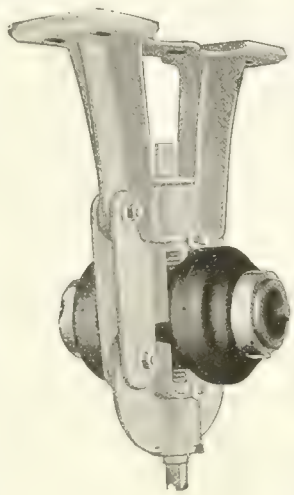
Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

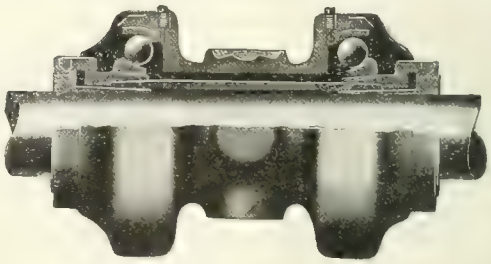
The Canada Metal Company, Limited

Hamilton Montreal • TORONTO Winnipeg Vancouver



LESS FRICTION—LESS POWER LOSS

There is 75% Less Friction with



Chapman Double Ball Bearings

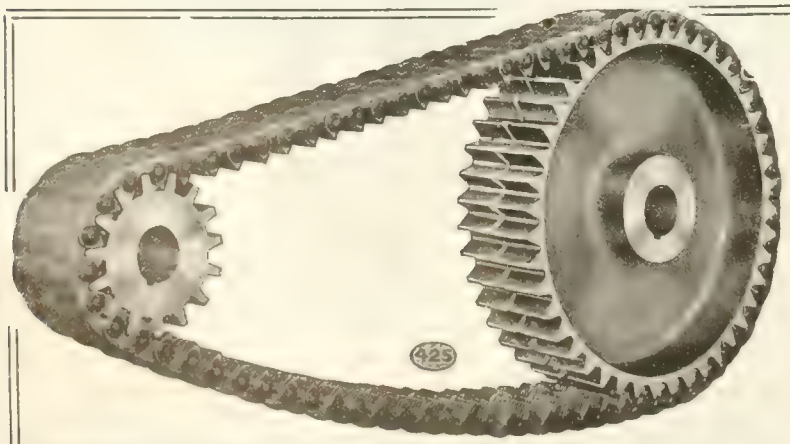
A factor of well recognized importance in a shaft hanger is Power Cost. Power cost goes up with increased friction. Friction in a well designed ball bearing is far less than in a sliding bearing. Then since Chapman Double Ball Bearings are designed solely for transmission purposes, users save 75% of friction loss in transmitting power.

Use of Chapman Ball Bearings means a saving in oil, a saving in labor of oiling and general attention required in Babbitted shaftings—and they are thoroughly dust-proof.

Chapman Double Ball Bearing Company of Canada, Limited

339-351 Sorauren Avenue, Toronto, Ontario

Transmission Ball Bearing Company, 1050 Military Road, Buffalo, N.Y.



RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. **ENGINEERS** **St. Nicholas Bldg. MONTREAL, P.Q.**

GRATON & KNIGHT

Standardized Series LEATHER BELTING

Tanned by us for belting use

GRATON AND KNIGHT

Are you trying to drive Pulleys with a Belting Specification?

How often does a belting specification get you the kind of belts you really should have? Do the belts you get agree with the specification? How many men in your plant could tell? Could **you?**

The only specification the belt buyer should attempt to make is a specification of the work to be done. Because to get the work done most efficiently and economically is the only possible reason for any kind of a specification about anything.

Graton & Knight offer you this practical specification—the work to be done. To do the work properly in every case is the basic idea underlying the Graton & Knight Standardized Series Leather Belts.

This Series was evolved to fit the working needs of actual conditions, *not* to meet theoretical conditions as described on paper. Every belt in this Series—and there is one for every transmission purpose—has been standardized only after it has been *proved* right.

Face these facts squarely—then consider the safety, ease and economy of buying Graton & Knight Standardized Belts. Not by guesswork, nor on discount—but on *standardized performance*.

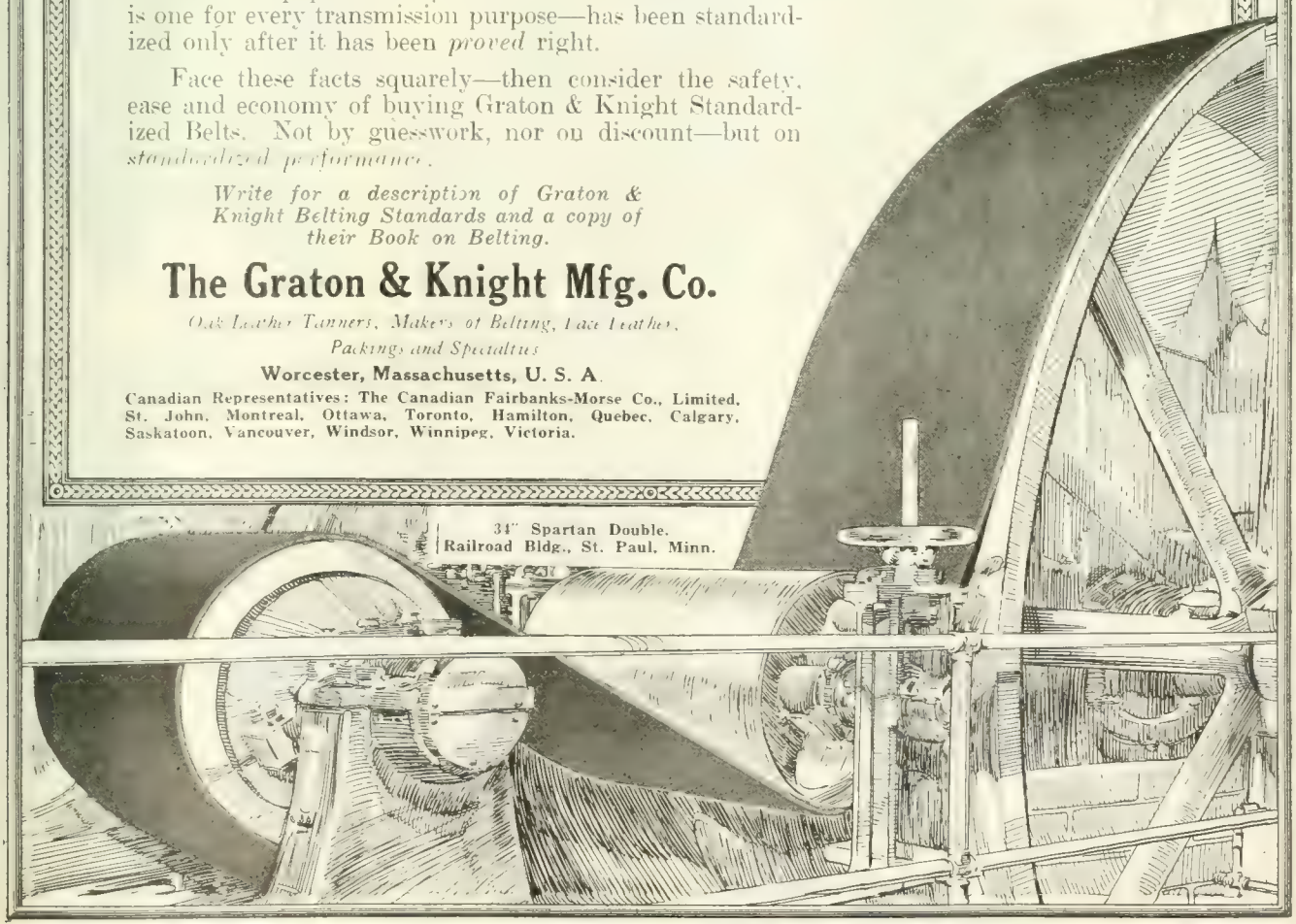
Write for a description of Graton & Knight Belting Standards and a copy of their Book on Belting.

The Graton & Knight Mfg. Co.

Oak Leather Tanners, Makers of Belting, Lace Leather, Packings and Specialties

Worcester, Massachusetts, U. S. A.

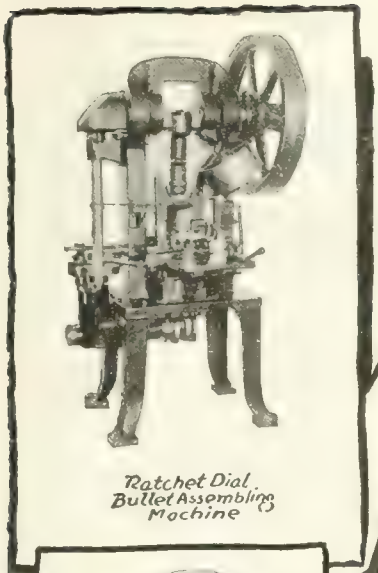
Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Vancouver, Windsor, Winnipeg, Victoria.

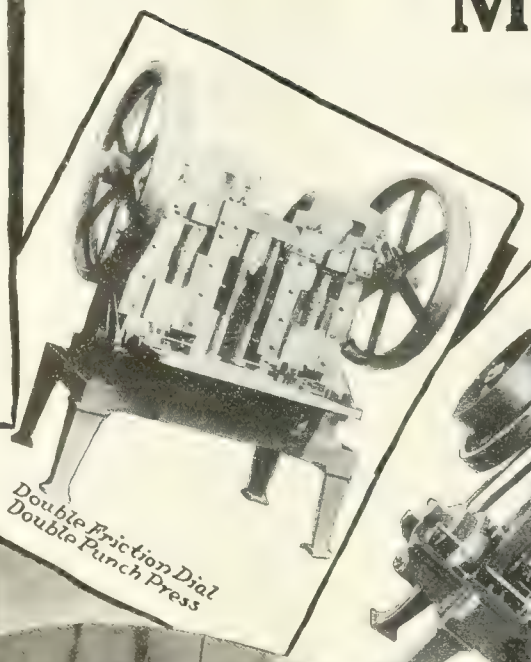


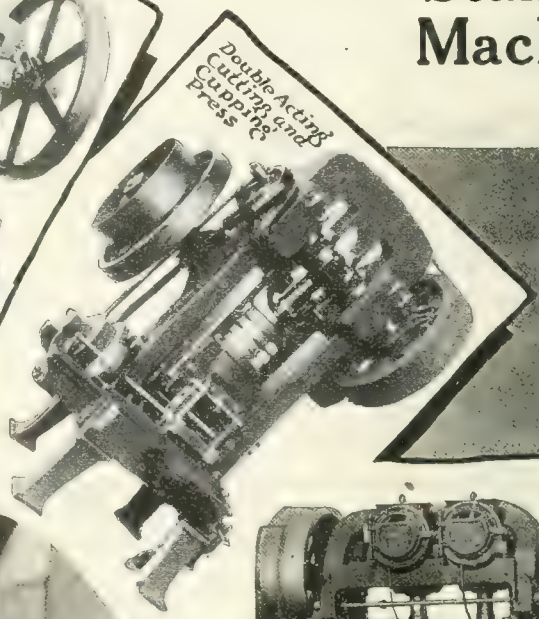
34" Spartan Double. Railroad Bldg., St. Paul, Minn.

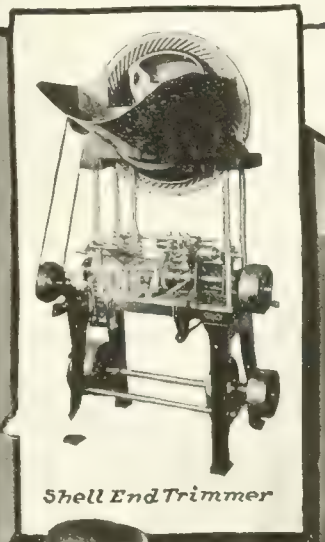
CARTRIDGE MACHINERY

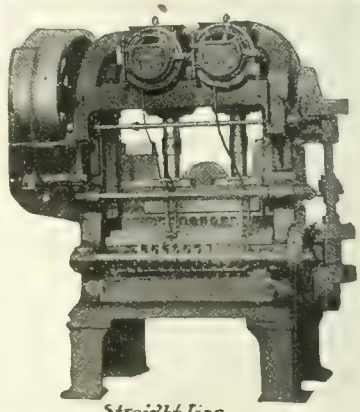
Waterbury Farrel Standard Machines


Ratchet Dial Bullet Assembling Machine


Double Friction Dial Double Punch Press


Double Acting Cutting and Cupping Press


Shell End Trimmer


Straight Line Bullet Assembling Machine

Standard Loading Machine in Government Arsenal

Horizontal Header Hopper Feed

The **Waterbury Farrel Foundry & Machine Co.**, of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.

The Value of a Clean-Cut Layout

Unless work is laid out accurately at the start, many difficulties will arise as the job progresses.

A confusion of faint lines may mean lost time and perhaps throwing away a valuable piece of metal.

It is important then that the lines be distinguished quickly, no matter how much they crisscross. The clean-cut lines made with a

Starrett
Surface Gage

will greatly aid machinists in preparing a clean layout on which work can be done accurately. This useful instrument may be used to scribe on all kinds of surfaces and is very handy for transferring measurements for duplicating work.

Our free catalog No. 213 will tell you more about this surface gage, also describes 2,100 sizes and styles of measuring tools. Write for it to-day.

42-661

The L. S. Starrett Co.
The World's Greatest Toolmakers
Athol, Mass.

Rivet Speed

One every second is a speed which this Grant Rivet machine will keep up indefinitely, in any degree of tightness or looseness desired. Each rivet is finished with perfectly shaped head, polished and with no hammer marks showing.

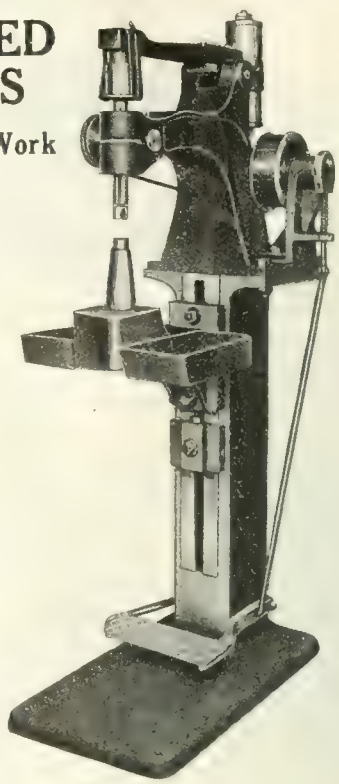
We claim this is the only machine manufactured that will accomplish this feat. Our claims are unchallenged. By writing for our catalogues you may obtain full information regarding the ability of this machine.

We are rivet machine specialists. Get in touch with us.

The Grant Mfg. & Machine Co.
Holland Ave., Bridgeport, Conn., U.S.A.

HIGH SPEED HAMMERS

For High Speed Work



FEATURES:

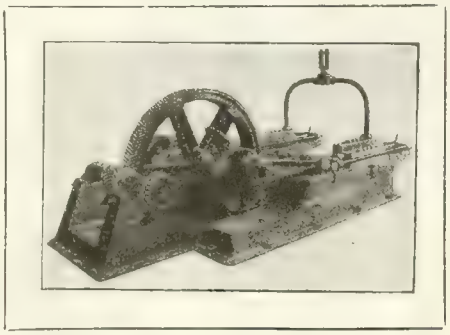
Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.

Sales Agents : The A. R. Williams Machinery Company Limited, Toronto, Ontario.



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

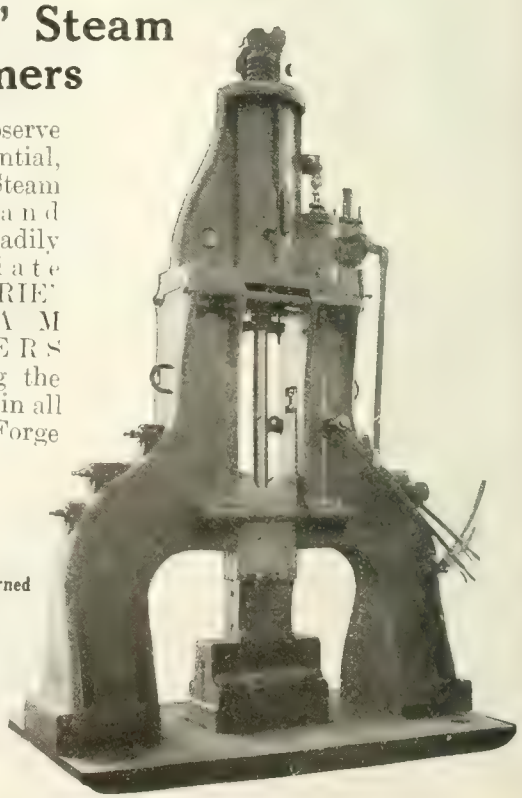
Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.



They have earned their enviable reputation.

ERIE FOUNDRY COMPANY
ERIE, PA. U. S. A.

The Connection Screws on Consolidated Presses

are made from steel forgings and are larger in diameter and stronger than on any other presses of corresponding size. Why? Because

The connection screws have to withstand all the pressure applied on the dies. We use only one-piece forgings, and in calculating the size, use a very high factor of safety.

A Press is only as strong as its weakest point. The connection screw is a source of constant trouble on some makes of presses.

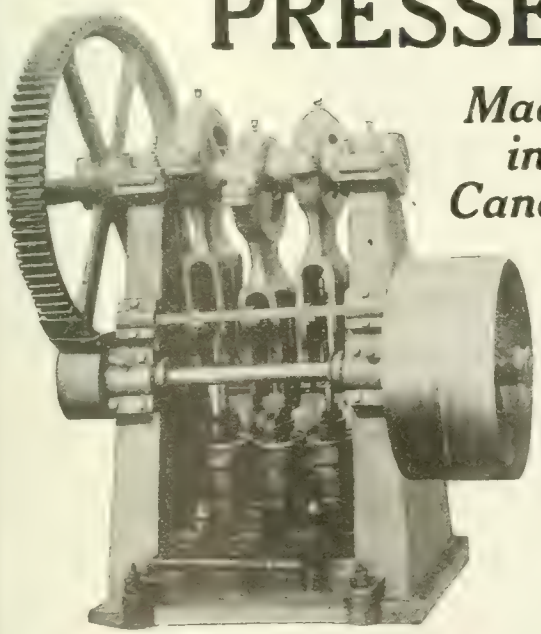
Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

PRESSES

Made in Canaaa



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

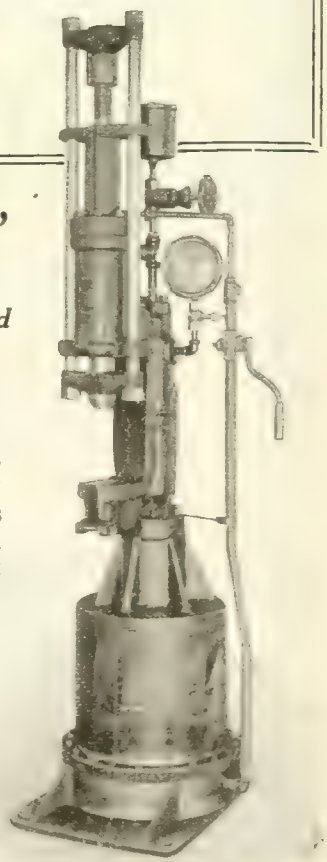
WILLIAM R. PERRIN, Limited
TORONTO, CANADA

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.
Leib & Wight Sts.,
DETROIT, MICH.
U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

BOWSER
ESTABLISHED 1885

Helps the Machinist To Do Better Work

The Bowser Lubricating Oil Storage System helps the machinist in many ways to do better work with less effort.

It insures a good supply of pure oil being kept ready for use at all times, and prevents break-downs due to faulty lubrication.

The oil is protected from dust, dirt and deterioration, and retains all its properties as a lubricant.

The Bowser System saves unnecessary labor. It can be placed where most easily accessible.

It can be used either in battery formation or each individual outfit placed where most convenient.

It prevents waste due to dripping, over-filled cans and careless handling.

It eliminates oil-soaked floors and the "fire hazard"—fire interrupts income and progress.

It makes every shop a better, cleaner place in which to work.

There is a Bowser built for every oil storage requirement, any capacity, hand or power operated.

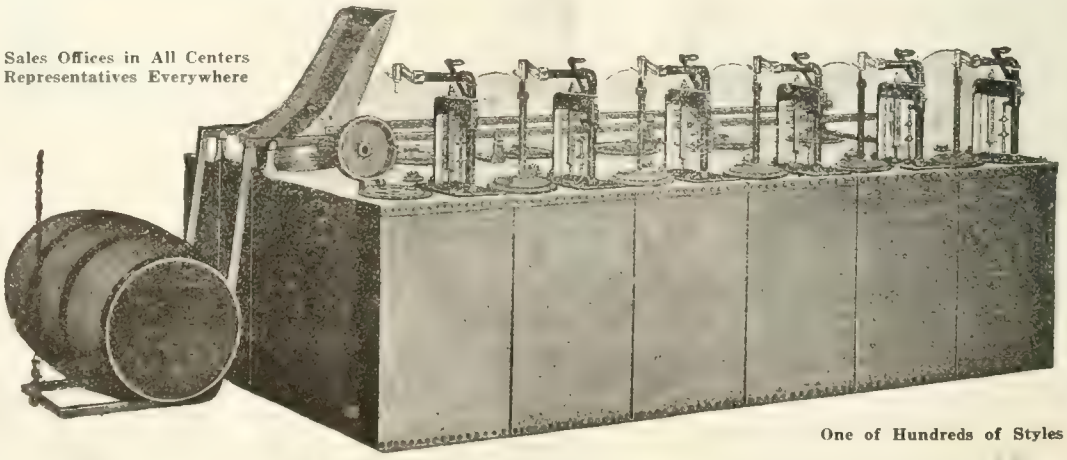
Write for illustrated bulletin

S. F. Bowser & Co., Inc.

ORIGINAL PATENTEES AND MANUFACTURERS OF OIL HANDLING DEVICES

TORONTO, ONT., 66-68 Fraser Ave.

Sales Offices in All Centers
Representatives Everywhere



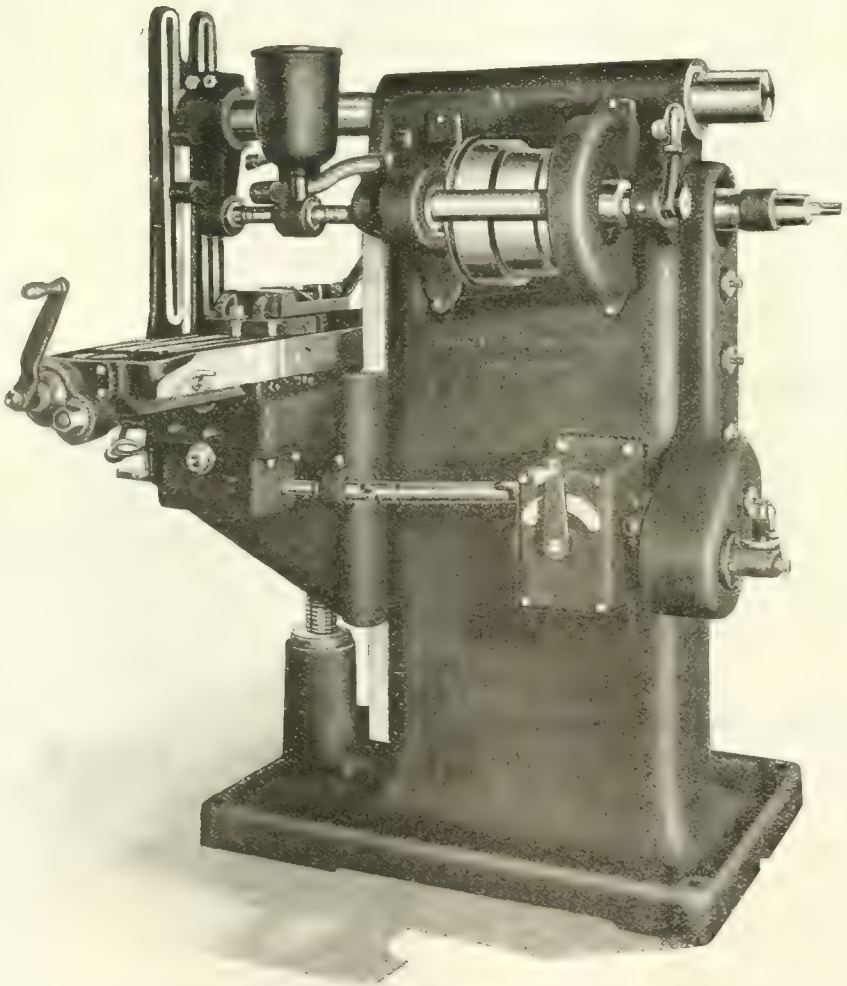
One of Hundreds of Styles

The Ford-Smith Machine Company

Ford-Smith Millers

Built in Four Sizes. All Gear Feeds.

No. 2 Plain—24″ x 7½″ x 19″.
No. 2 Universal—25″ x 8″ x 18″, all power feeds.
No. 3 Plain—34″ x 10″ x 20″.
No. 3 Universal—30″ x 10″ x 19″, all power feeds.

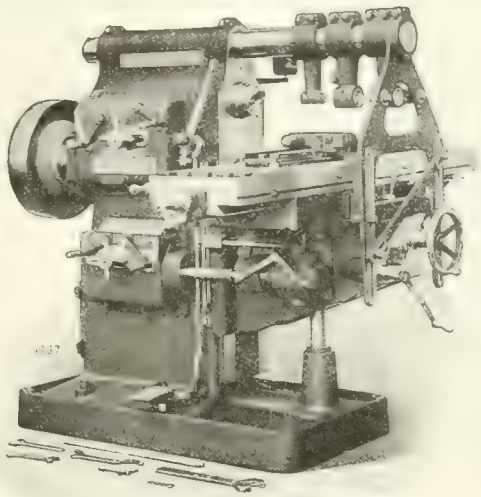


We can now offer interesting deliveries on these machines.
Let us have your enquiry.

The Ford-Smith Machine Company, Limited

HAMILTON, CANADA

Cincinnati High Power Millers



One of our 9 High Power Single Pulley Plain Millers. We also make 9 cone driven plain machines, and a full line of Universals.

Unusual Spindle Power

Heat Treated Alloy Steel Gearing for the Spindle Drive

Flanged Spindle End

which makes Face Milling Cutters Interchangeable in all sizes of Machines.

Handy and Easy to Operate

These are some of the reasons why you should use

Cincinnati High Power Millers

ASK FOR CATALOG

The Cincinnati Milling Machine Company

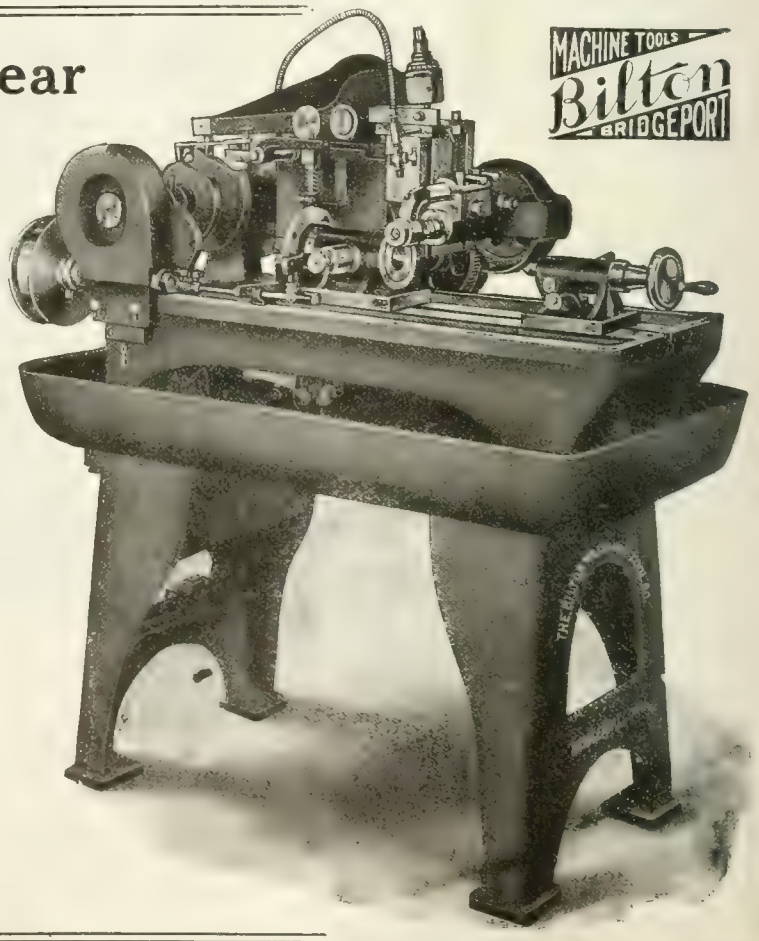
CINCINNATI, OHIO

Canadian Agents: H. W. Petrie, Ltd., Toronto Ont.; H. W. Petrie of Montreal, Ltd., Montreal, Que.; Taylor Engineering Co., Ltd., Vancouver, B.C.

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch



The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

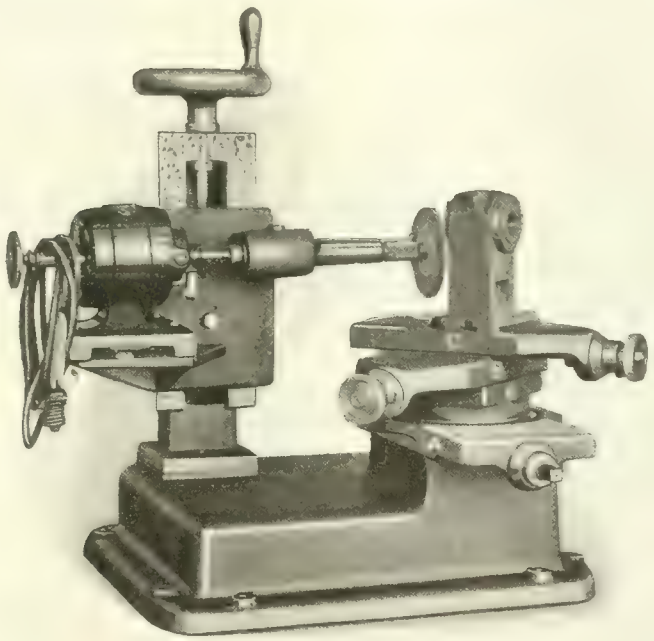
Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Riveting Machines
Milling Cutters

Catalog 30 on request.

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited

The Cleveland Milling Machine Company

PROFILE GRINDER



Grinds concave and convex milling cutters 12 in. diameter, 3 in. radius, cutters for fluting drills, cutters that are irregular but having a number of true curves, accurately rounding the corners on side mills, face mills, and end mills, formed tools for screw machines and corner rounding tools for the lathe, planer and shaper.

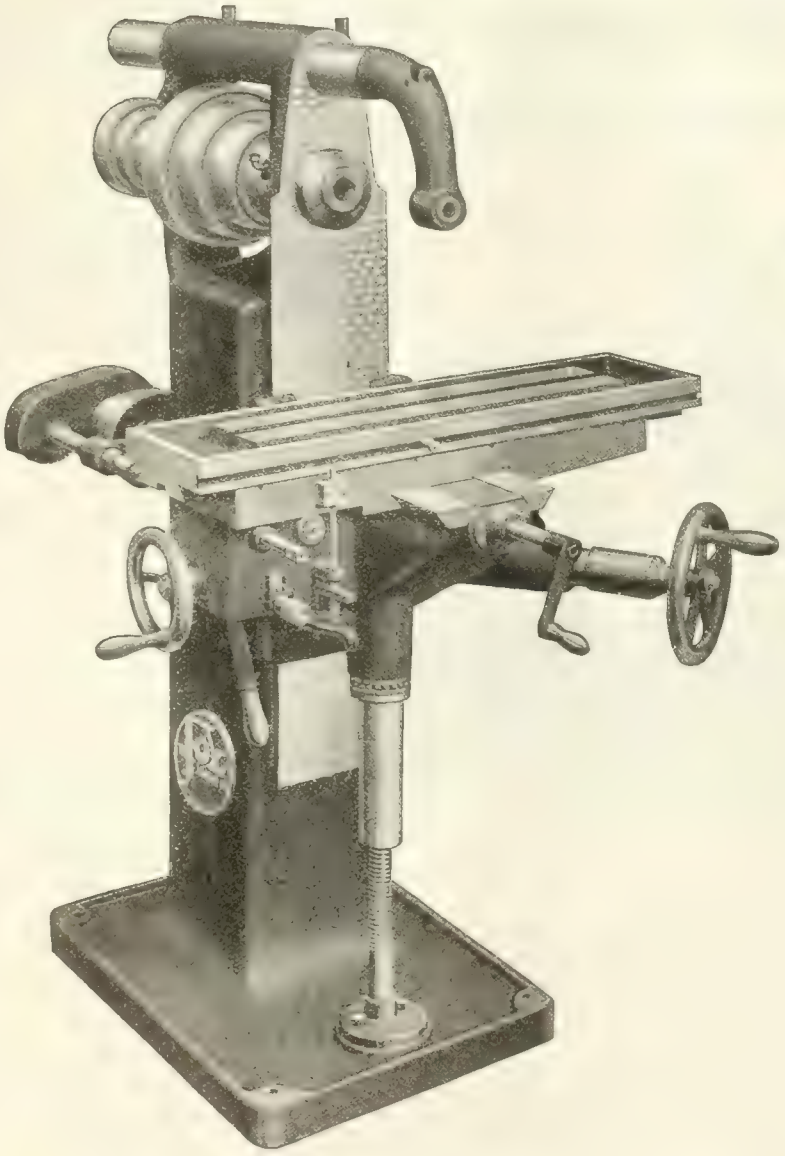
This machine spindle is driven by a Dumore Type D Universal motor, runs on any current. Ten feet of wire with lamp socket and all necessary equipment furnished.

By acting quick you can have immediate delivery.

The Cleveland Milling Machine Co.
18511 Euclid Ave. Cleveland, Ohio

If any advertisement interests you, tear it out now and place with letters to be answered.

The Fox Milling Machine
For Intense Production



Fox
MILLING MACHINES
lead the field

Power Feed
Miller No. 3

The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY
1047 W. Ganson Street, Jackson, Michigan

Mention this paper when writing advertisers. It will identify the proposition about which you require information.

KEMPSMITH

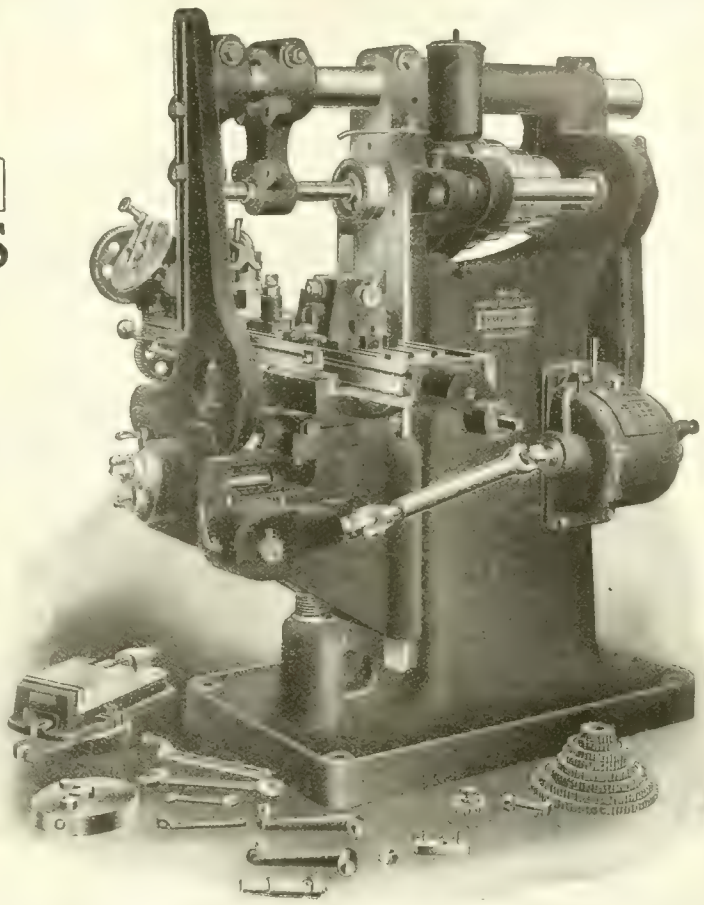
UNIVERSAL MILLING MACHINES

Are built in three standard sizes. They embody every worth-while feature to be found on a tool room Milling Machine.

We call especial attention to the Dividing Head which is part of the regular equipment of every Universal Miller.

The Kempsmith Dividing Head is compact and rigid, unusually convenient in operation and so constructed as to maintain its accuracy under heavy service.

We publish a thirty-two page book elaborately illustrating and describing this Dividing Head. A copy will be sent free on request. Just ask for "Dividing Head Book."



Kempsmith Manufacturing Co.

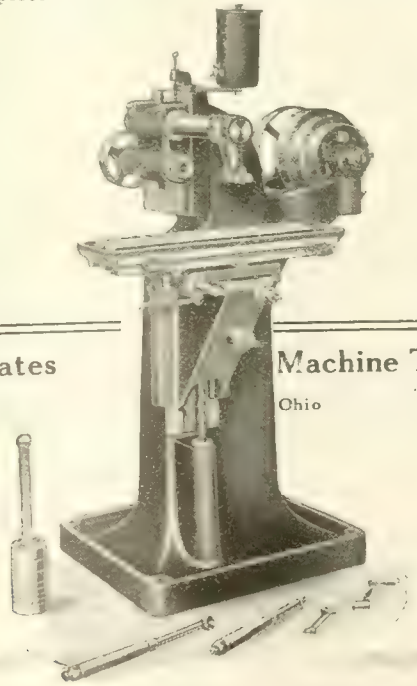
MILWAUKEE, WIS., U.S.A.

AGENTS:

Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.

No. 1 U.S. Milling Machine

Built to take care of the work that it would not pay to put on a larger machine. You would be astonished at the results, the range of work and the compact nature of this machine. An inquiry would secure you complete information.



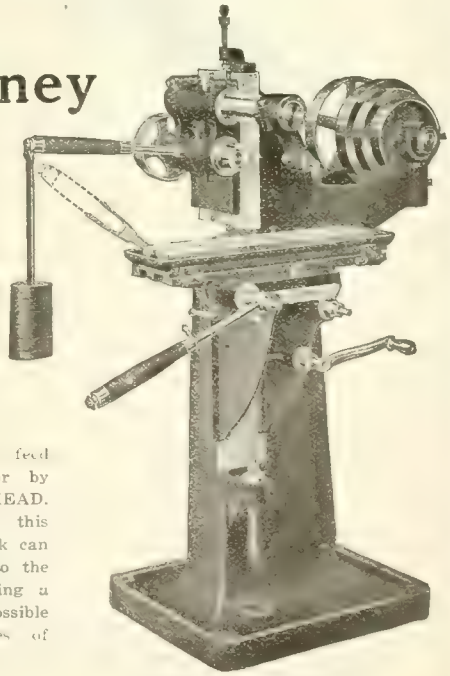
United States Machine Tool Co.

Cincinnati Ohio U.S.A.

THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine



The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

Chains—Keys—Hand Milling Machines.

If any advertisement interests you, tear it out now and place with letters to be answered.

HALL

Pipe Threading Machinery
and
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction.

Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

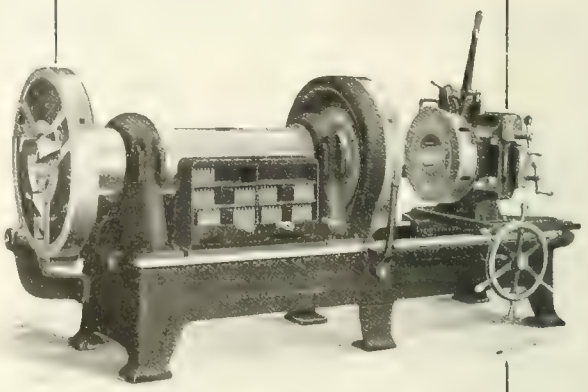
Write us for catalog and prices on:

Pipe Threading Machines
Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

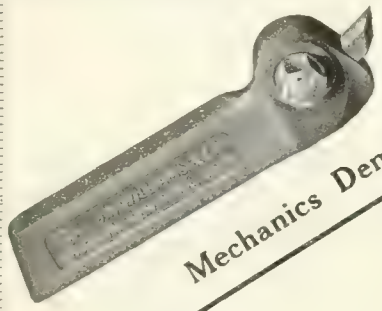
JOHN H. HALL & SONS, LIMITED
BRANTFORD ∴ CANADA

EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity 2½" to 8" inclusive



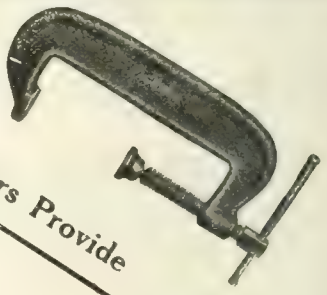
Mechanics Demand

Turn Where You Will
The World Employs

WILLIAMS'

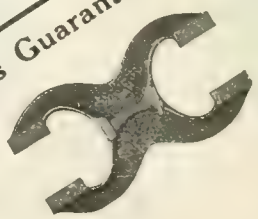
GRAND TRADE MARK W PRIZE

Drop Forged Tools



Dealers Provide

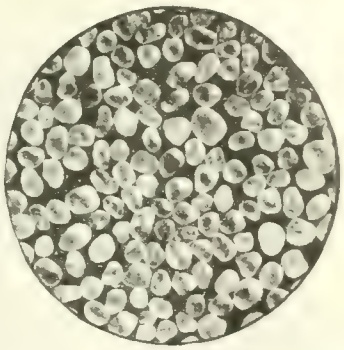
Publicity Promotes



Makers Guarantee

FLINT SHOT

Have You Investigated Flint Shotting of MUNITIONS?



"Every Grain Like a Pearl"

Flint Shotting is *sand blasting* with a college education.

It is doing, in a highly efficient way, work that is commonly done by-guess and by-gad.

Because Flint Shot is not an accidental aggregation of sand grains of various kinds, sizes and hardnesses, but a collection of highly uniform, pearl-like nodules of *pure flint*, secured by the mechanical disintegration of St. Peter's Rock.

Even common sand blasting has advantages over older forms of cleaning brass, iron and steel castings, forgings, etc., that you should know about.

But Flint Shotting *multiplies* these advantages.

We have accumulated a mass of interesting data on the sand blasting of metal surfaces and may have information that will speed up your output, decrease your cost, and improve the character of the finish of your products.

When you send for our Flint Shot Booklet, tell us something about your products and how you clean them.

U. S. Silica Company

430 Peoples Gas Building **Chicago, Illinois**

If any advertisement interests you, tear it out now and place with letters to be answered.

MUNITION MAKERS

Need the best power blades they can buy for their metal cutting —need them for economy and speed of production and to save blade cost.

Buy your blades by careful efficiency tests for rapidity of cutting and number of cuts and you will standardize on

MILLERS FALLS
STAR HACK SAW BLADES

WE CAN MAKE PROMPT DELIVERY ON ALL SIZES.

Star Blades are made in a different way than any other blade. Patent hardening process makes them harder, faster cutting and more uniform as comparative tests will show.

Your blade cost and your manufacturing cost are less when you buy the Star.

Mechanic's Handbook containing much valuable mechanical information, never before printed, and pocket catalog--free on request.

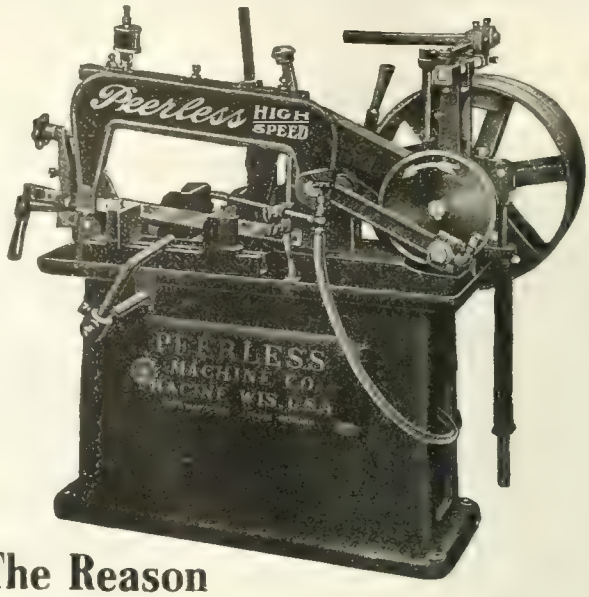
Millers Falls Company

"Toolmaker to the Master Mechanic"

Millers Falls, Mass.

New York Office: 28 Warren Street

MILLERS FALLS TOOLS



The Reason For So Many Repeat Orders

after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

A third order just came in from one of the largest concerns in the United States, and is it not a fact after a firm has standardized on a certain make of tool that some real results must be produced in order to effect a change?

One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

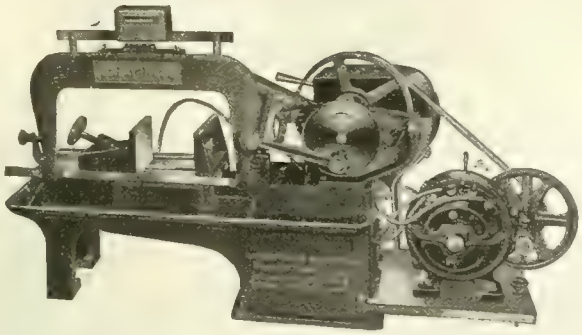
PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

The Improved Taylor-Newbold

INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, U.S.A.



We will send a Racine on a Trial Basis—*Why?*

The Racine machine is the only high-speed metal-cutting machine in the world that is absolutely positive in every action, and will duplicate itself in every cut during the entire life of the machine. All wearing parts are adjustable and accurately machined.

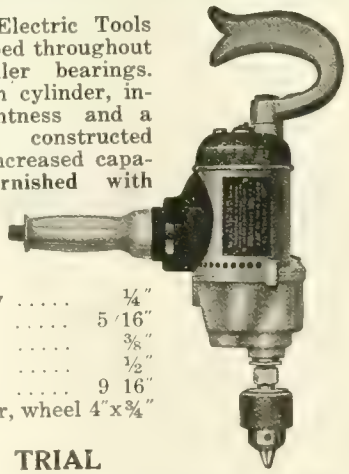
Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent

The only Portable Electric Tools made that are equipped throughout with ball and roller bearings. Made with aluminum cylinder, insuring extreme lightness and a powerful specially constructed motor resulting in increased capacity. Can be furnished with Universal, Alternating or Direct current motor 110 or 220 volts.



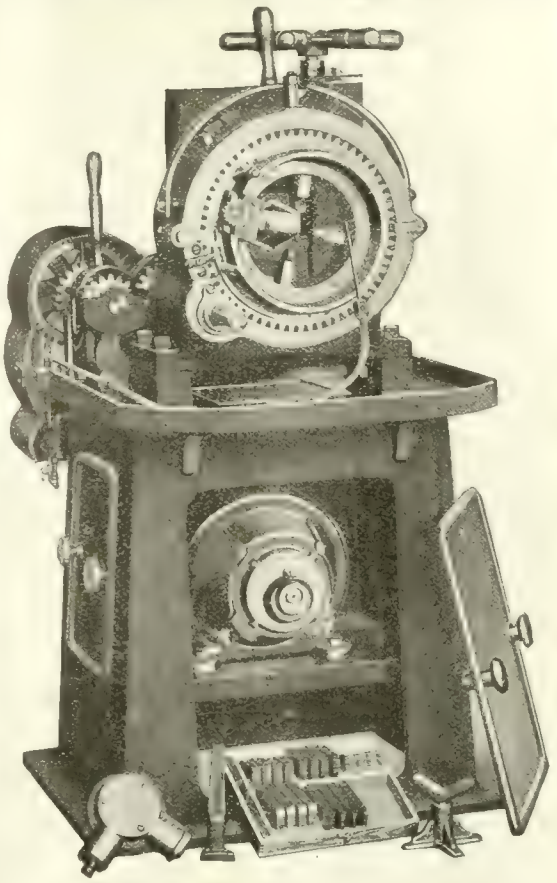
000	Drilling Capacity	¼"
00	" "	5/16"
0	" "	⅜"
01	" "	½"
1	" "	9/16"

No. 6 Electric Grinder, wheel 4"x¾"

SHIPPED ON TRIAL

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.
Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E;
Vancouver: 1142 Homer Street



"Forbes Facts"

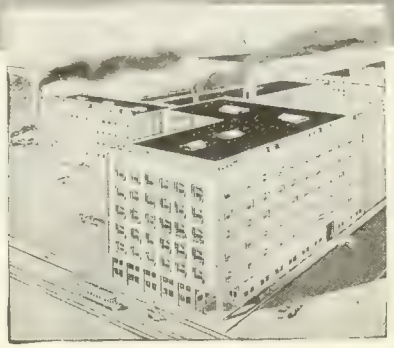
1. One man can do the work of six against the old stock and die method of cutting.
2. It is the only machine on the market with receding gear.
3. It is self-contained and motor-driven.
4. It is portable.

These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

The Curtis & Curtis Co.
115 Garden St. Bridgeport, Conn.

PEXTO TRAVELS - KANSAS CITY

Display of Pexto Sheet Metal Working Machines and Tools at the recent National Educational Association Convention at Kansas City



Display of Richards & Conover Hdwe. Co., Kansas City, with permanent Pexto display, similar to above as maintained

Industry's First Choice is the School's First Choice

Just as Pexto Sheet Metal Machines and Tools stand first in the Sheet Metal Industry they also take first rank in the Technical Schools of the country.

Naturally, school officials and school shop instructors who aim to supply capable student graduates look to the advanced industries for guidance in the selection of their equipment.

So you'll find Pexto Equipment in both industry and school as at example see the illustration above. It is the practical working display of Pexto Sheet Metal Working Machines and Tools that attracted such favorable attention at the National Educational Association Convention held at Kansas City from February 26th to March 2nd. During this most instructive meeting a complete school assortment of Pexto Machines and Tools was operated by several students and a senior student director from the Lathrop Schools of Kansas City.

In addition to the showing of Pexto School Equipment, fifty-one models of sheet metal work produced by students of Carnegie Institute of Technology of Pittsburgh, were on display.

These models, shown in the above illustration were produced under the direction of J. S. Dougherty, Instructor of Sheet Metal Working in this well known Pittsburgh Institute.

A Permanent Pexto Display at The Richards & Conover Hardware Co.

This well-known institution in the hardware trade maintains a similar display to that shown at the N. E. A. Convention in its permanent exhibiting rooms. It is in this and similar displays in the largest hardware and machinery houses all over the country that you will find the most modern sheet metal working equipment.

Pexto has more than kept pace with the rapid strides made in the industry during the last few years. A visit to any of these displays will be of practical benefit.

In case Kansas City is not a convenient point for you to visit let us direct you to our nearest display, probably in your own city. In the meantime send for our Pocket Manual. It illustrates and describes all of the newest ideas besides giving you much other valuable data. Of course it is sent free.

PEXTO

The Peck, Stow & Wilcox Co.

Makers of Machine Hand Tools for Sheet Metal Workers, Tinners and Manufacturers, Builders' and General Hardware

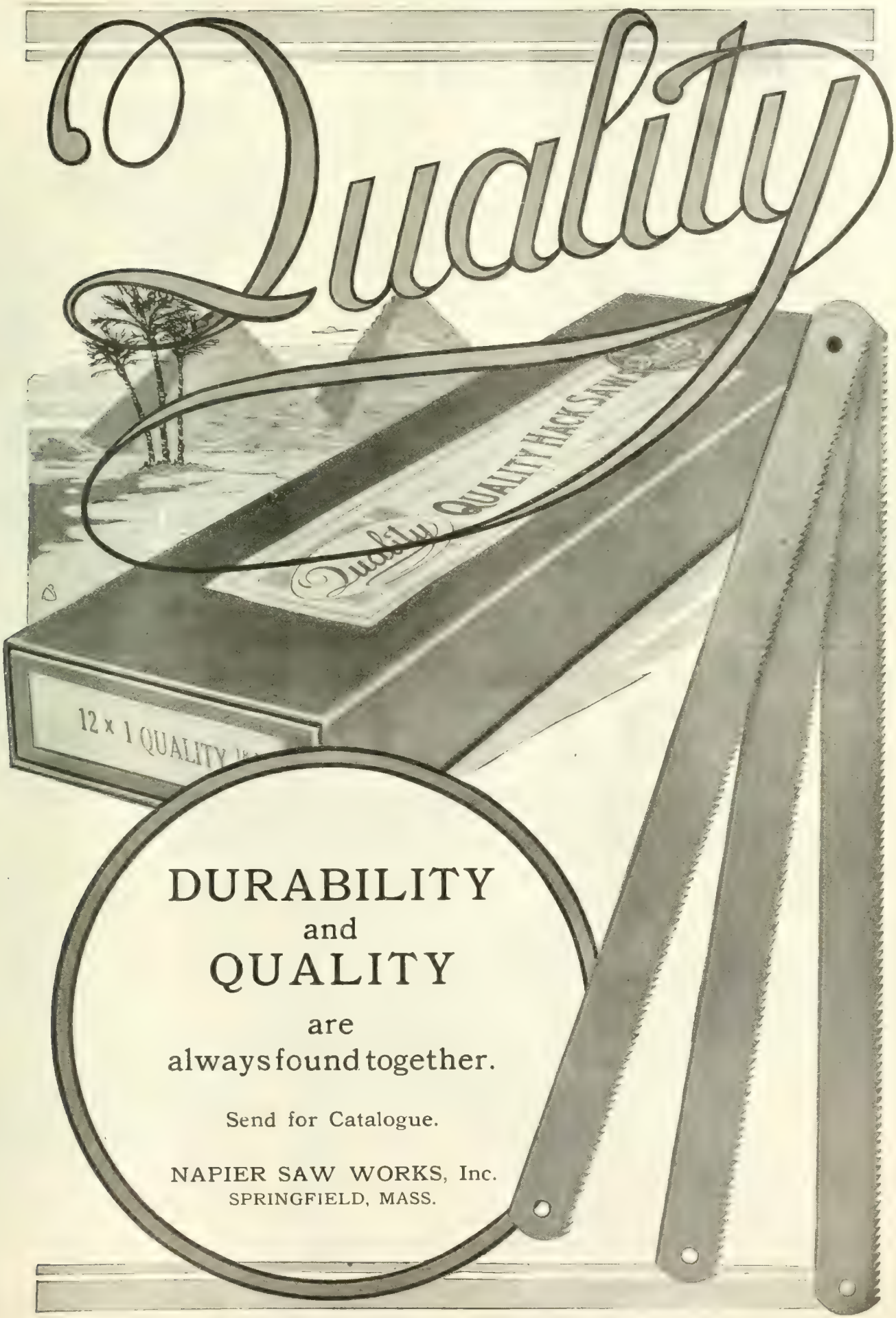
Southington, Conn. Cleveland, Ohio

Address correspondence to 208 West Center Street Southington, Conn.

PEXTO

SHEET METAL WORKERS' MACHINES & TOOLS

if any advertisement interests you, tear it out now and place with letters to be answered.



DURABILITY
and
QUALITY
are
always found together.

Send for Catalogue.

NAPIER SAW WORKS, Inc.
SPRINGFIELD, MASS.

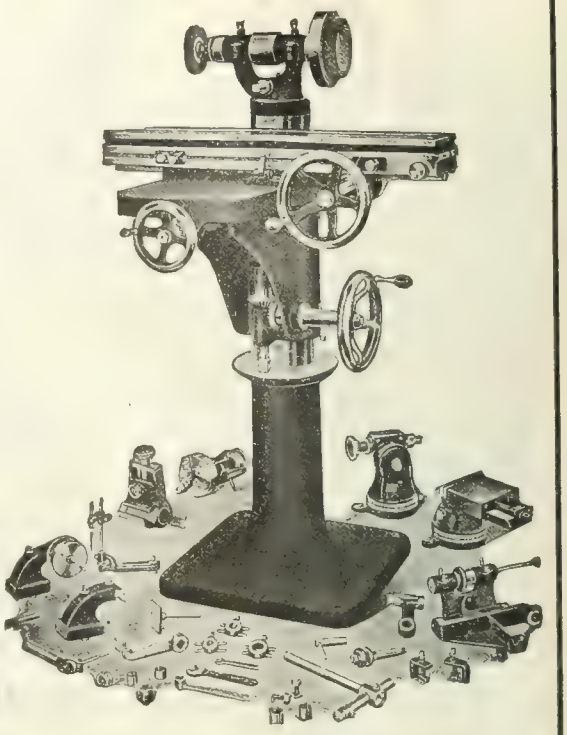
If any advertisement interests you, tear it out now and place with letters to be answered.

TOOL GRINDING

Milling Cutters, Reamer Counterbores, etc.

can be most conveniently sharpened on the various attachments furnished with the

Greenfield



These Attachments are simple, practical and require no complicated adjustments, each being complete in itself. This feature alone will save a vast amount of time in "setting up." We claim, and we believe with perfect justice, that there is no other tool grinder that can be shifted from one job to another as easily and quickly as this one.

We are always glad to send out catalog which illustrates each attachment in actual use. It might have some suggestions for you.

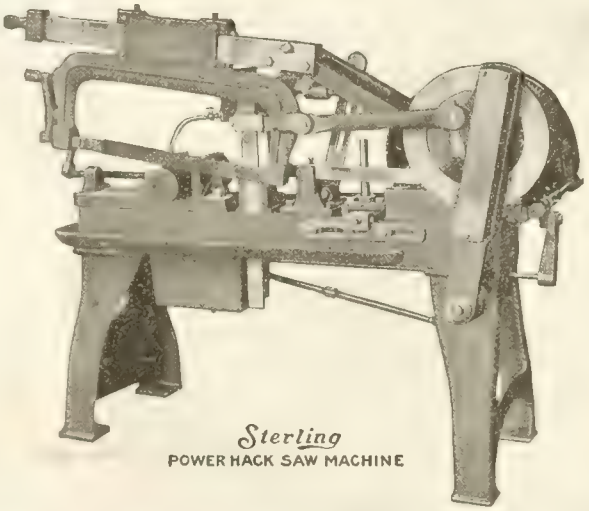
Greenfield Machine Company
Greenfield, Mass., U. S. A.

"STERLING"

CUTTING COMBINATION

For cutting bars and blooms, this heavy-duty Power Hack Saw will do most rapid work, and we believe has no superior in this or any other market. In connection with this machine, to get real, effective, rapid and satisfactory work, a good blade must be used. We don't believe the "STERLING" has any superior — we know it's good.

Try the combination.



Sterling
POWER HACK SAW MACHINE

Manufactured by **Diamond Saw & Stamping Works, Buffalo, N.Y., U.S.A.**

CLEVELAND SAND RAMMERS

FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Ramming in general foundry service.

The Piston Rods are packed with a resilient packing that conforms to the shape of Rod without retarding its free action, and prevents any dirt from entering piston chamber and working parts— Rammers are fitted with either Round or Flat Rods as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.

CLEVELAND CHIPPING HAMMERS

For General Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are particularly adapted for fast chipping now required by piece-work operators.

BOWES AIR HOSE COUPLINGS

Over 1,000,000, in General Use

Bowes Couplings are instantly connected or disconnected.

Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

In Stock :—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, ETC.

Catalog No. 12 mailed on request.

ADDRESS ALL INQUIRIES TO

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 CHESTNUT STREET, TORONTO, ONT.

Agents: A. R. WILLIAMS MACHINERY CO., TORONTO **WILLIAMS & WILSON, MONTREAL**

Sand Rammer in operation.

One Firm Saved $187.00 Per Day

By using

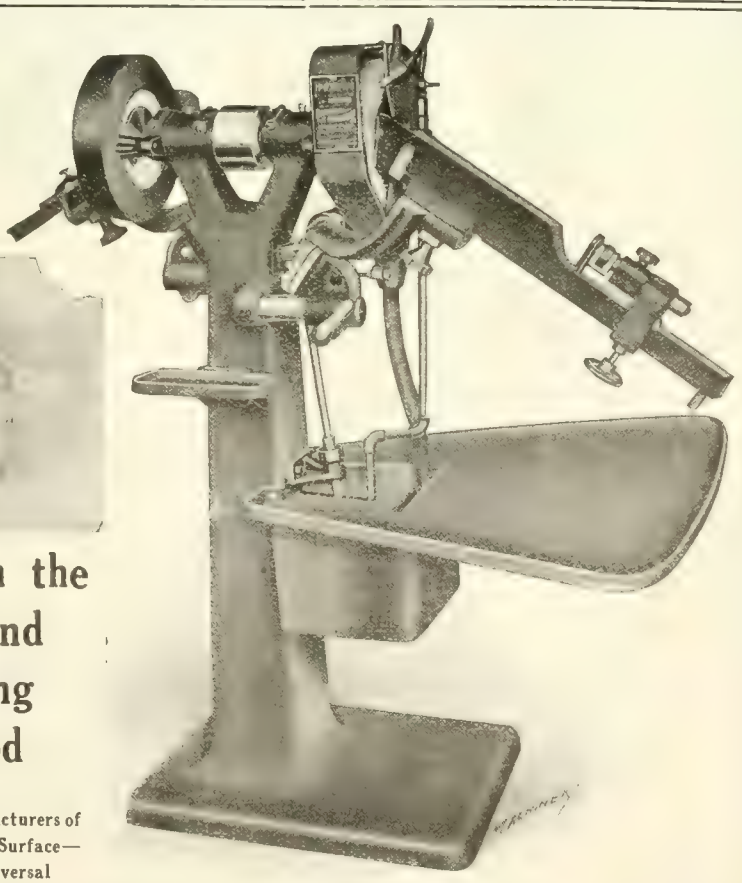
The New Yankee

Drill Grinder

It Gives 100% **Efficiency**

Against

40% with the Old Hand Grinding Method



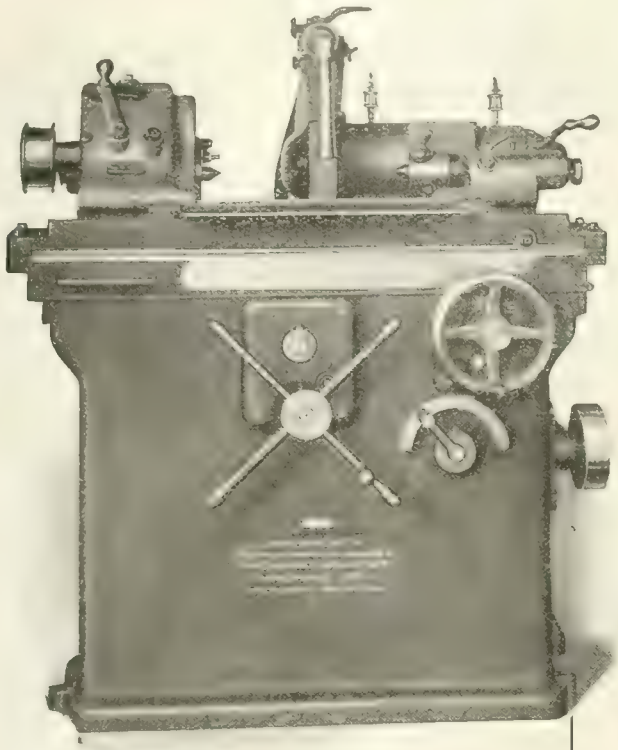
WILMARTH & MORMAN CO.

1200 MONROE AVE., N.W.

GRAND RAPIDS MICHIGAN, U.S.A.

Manufacturers of Drill—Surface—Universal Grinders

If any advertisement interests you, tear it out now and place with letters to be answered.

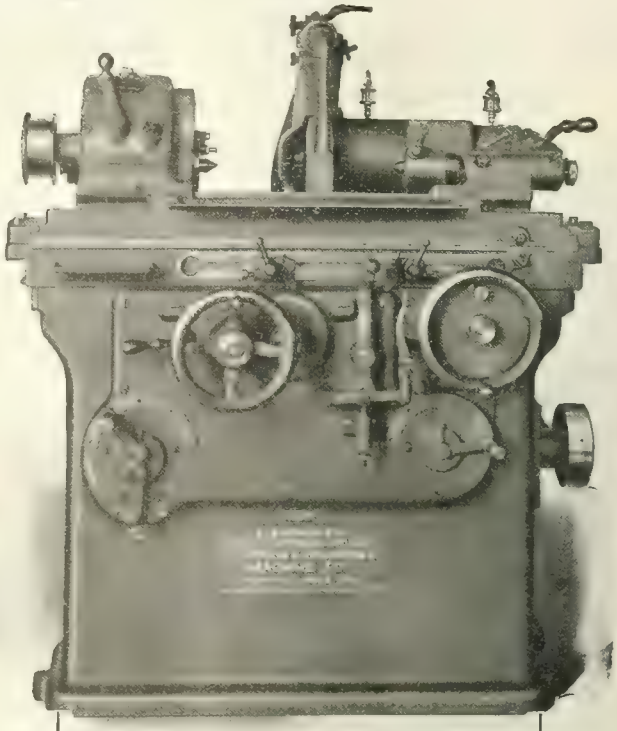


Model "B"

Where precision and mathematical exactness are required, this six by twenty Grinder will handle the work to your entire satisfaction.

The large pilot wheel operating the traverse table is designed to give convenience, speed and full control of the machine. Model "B" is a compact machine occupying only 52" x 66" floor space, yet it is a veritable giant in its capacity for work. Viewed as a unit this Model "B" is decidedly a grinder of real worth, requiring 7 h.p. to operate, 640 R.P.M. on tight or loose pulleys, with a 16" x 2", 3" or 4" face grinding wheel. Three wheel speeds, 1300, 1500, 1800.

We will appreciate an inquiry from you. Our catalogue is at your disposal.



Model "A"

Compactness, speed and range of work comprise the features that point this machine out as one of exceptional merit. Occupying 52" x 66" space it will prove great saver in your floor outlay. A great many of the parts of these two machines are interchangeable.

For grinding straight or taper-work of cylindrical form within its range. Dead or live centres may be used. It has no equals for work of a cylindrical character, and will be a short-cut to increased production.

If you get in touch with us you will benefit by the experience of our engineers who are ready at all times to co-operate with you. No obligation on your part.

Fitchburg Grinding Machine Company

Fitchburg **Mass.** **U.S.A.**

Gardner Grinders

GRINDING BASE OF 18-pr. SHELL

This No. 14 Double Disc Grinder is used for accurately sizing the bases of these shells after heat treating. The shell is held in a suitable fixture, which allows it to be revolved slowly between the discs which grind the diameter to within 3.28 and 3.29 inches.

The quality and finish of the work is perfect, and steady production can be maintained at an average rate of 5 per minute.

The discs are faced with abrasive at the outer part only, where the work is done.

All that is best in material and workmanship goes into Gardner Grinders. They last long, do the work as it should be done, and do it economically.

Drop a card for full particulars.

The Gardner Machine Company, Beloit, Wis., U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

STANDARDIZED CUTTING QUALITIES

Since the one purpose of a file is to cut, the toughness, regularity and sharpness of the teeth are all important.

A capable mechanic can positively "feel" these qualities in a "Famous Five" file.

The sharp, keen-edged teeth arranged in uniform rows—plus the even balance—tells him at once the file is a good serviceable tool.

It is these qualities that have made "Famous Five" Files Standard Grade tools everywhere.

Specify them when ordering.

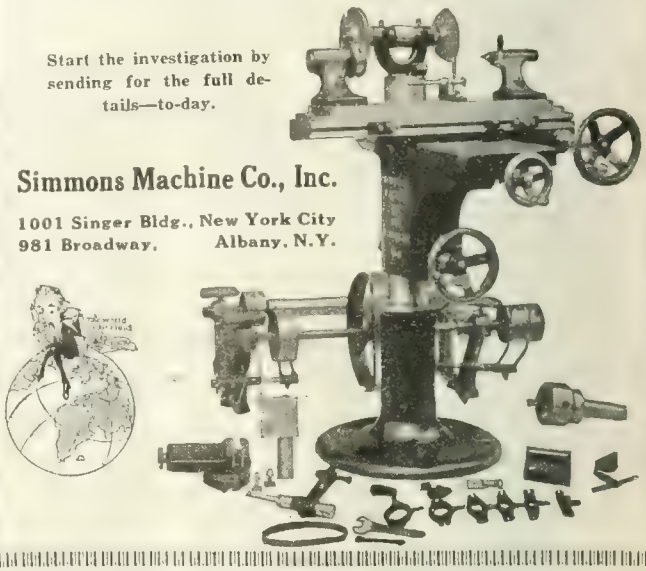
Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6
Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.



Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

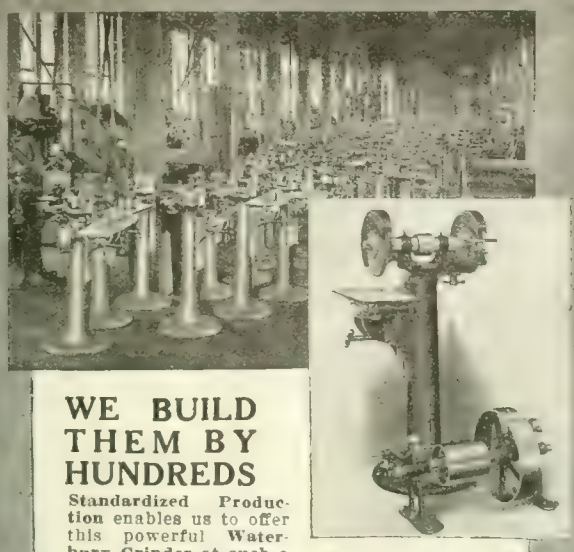
Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

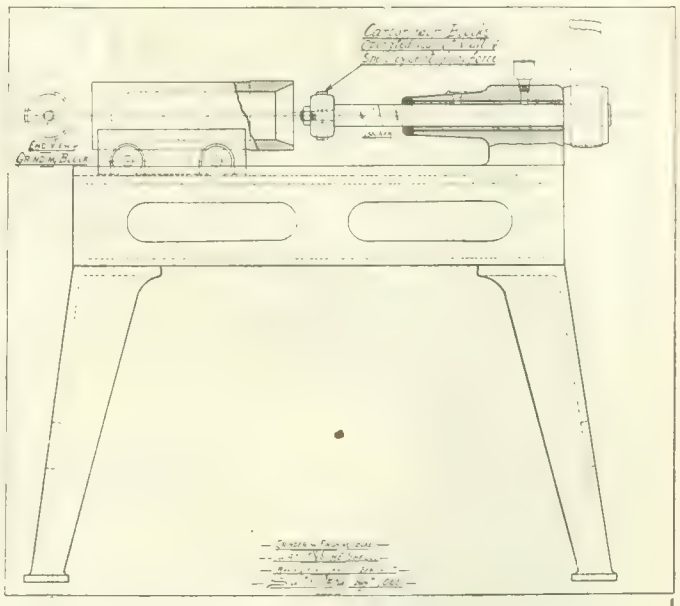


WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable practical grinding outfit.

only $75 Complete

The Blake & Johnson Co., Waterbury, Conn.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn Limited

BELLEVILLE, ONTARIO

Keep Your Grinding Wheels in Trim —

The Diamo-Carbo Emery Wheel Dressers

The Diamo-Carbo Dresser is being very generally adopted as a substitute for the expensive diamonds. Diamonds are becoming more scarce and quality is deteriorating. The quality of the Diamo-Carbo is uniform and in most places will do the same work as a diamond. They can be tried at our expense.

The Desmond Huntington No. 2 is the best dresser ever devised for use on large and coarse wheels.

We can make prompt deliveries of any type of Dresser desired.

THE CANADIAN DESMOND-STEPHAN MFG. CO.
HAMILTON, ONTARIO

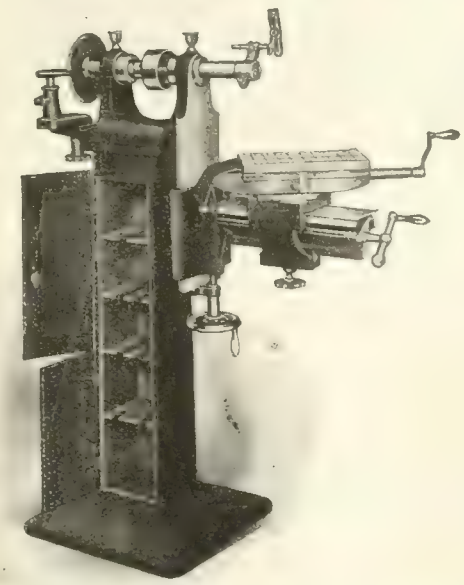
Alfred Herbert, Limited, Coventry, Eng.
Agent for Great Britain

If any advertisement interests you, tear it out now and place with letters to be answered.

OBTAIN THE BEST RESULTS

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL
CUTTER AND SURFACE GRINDERS



GARVIN No. 3. Universal Cutter and Surface Grinder. Use Code Banish.

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information *ASK YOUR DEALER or WRITE US DIRECT*

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (***Visitors Welcome***) **50 Years New York City**

The Munitions Worker's Grinder

The cut illustrates our No. 7 "LITTLE DAVID" Grinder, fitted with 21" Extension Shaft, housing and outer bearing. The grinding wheel is 6" x 1", of composition suited to the work, and its free speed is 3,000 r.p.m. Weight, 24 lbs.

This style of Grinder is just what you need for grinding the insides of High Explosive Shells, or any work where grinding, buffing, or touching up is to be done.

They are widely used in munitions plants, because they are **convenient, efficient** and **time-saving.** We use them in our own munitions work, and can tell you how to apply them to the best advantage. Ask our nearest branch for information and prices.

CANADIAN INGERSOLL-RAND CO., LIMITED

COMMERCIAL UNION BUILDING - MONTREAL, CANADA

SYDNEY TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

Works: Sherbrooke, Que.

Grinding Bushings On Drilling Jigs

This is one of the many jobs where the DUMORE comes in handy in a Tool Room. The hardened steel bushings in this Drilling Jig must be finished accurately, and both bushings must be ground at the same operation in order to insure perfect alignment. The

DUMORE PORTABLE ELECTRIC GRINDER

is the ideal tool for grinding dies, gauges and similar work where extreme accuracy is necessary. Used in hundreds of machine and repair shops for all kinds of grinding jobs. Manufacturers regard them as indispensable for handling the many difficult, hard-to-get-at jobs that continually arise. They will be the most popular tools in your shop.

The high speed at which DUMORE Grinders operate—10,000 R.P.M. and 30,000 R.P.M.—gives the correct surface speed to wheels of very small diameter. This prevents the wheels from breaking down and your work will be ground accurately and will be entirely free from bell mouth.

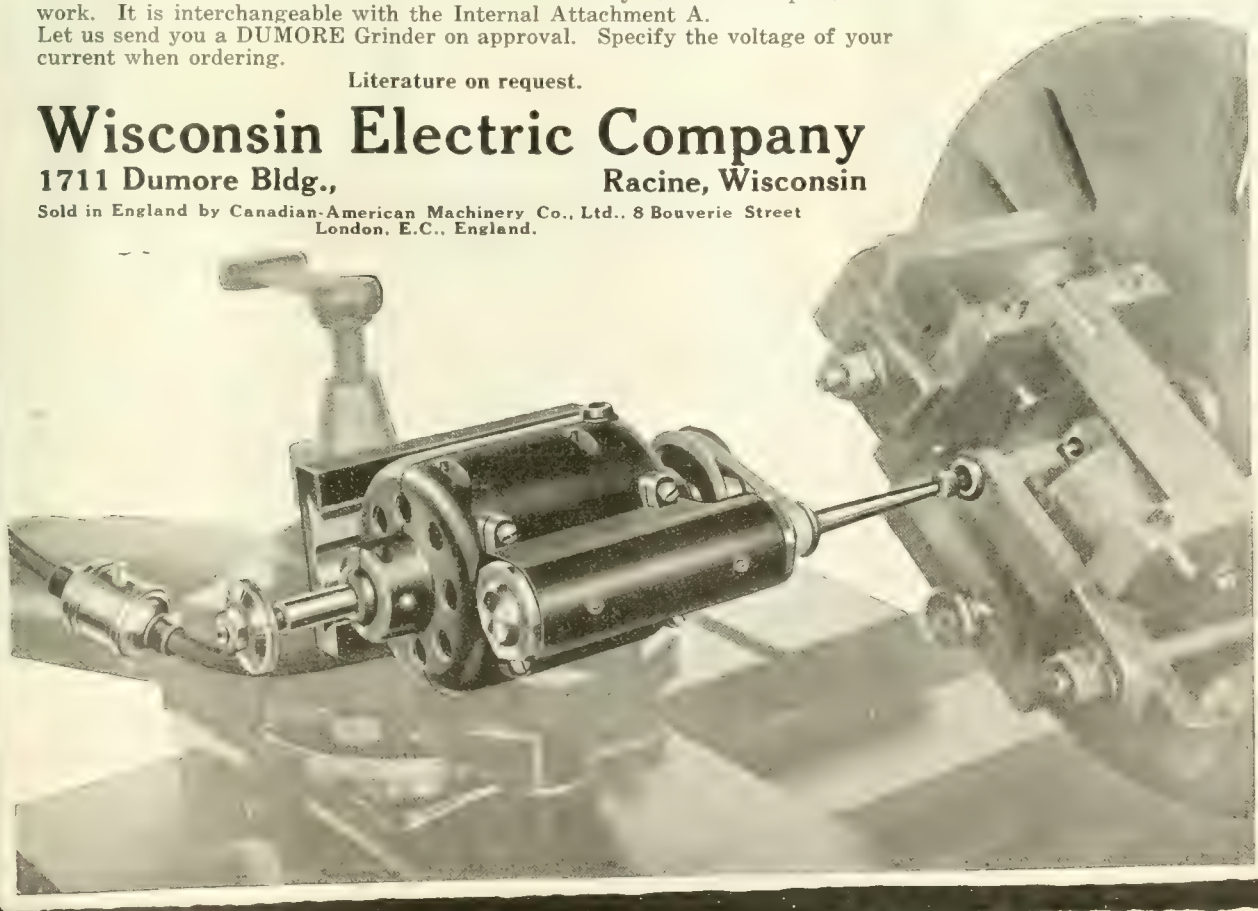
Equipment A as shown below includes the Internal Attachment A which operates at a speed of 30,000 R.P.M. Equipment B includes the Extension Arm B which has a reach of 10″ and which will be found very useful for deep internal work. It is interchangeable with the Internal Attachment A.
Let us send you a DUMORE Grinder on approval. Specify the voltage of your current when ordering.

Literature on request.

Wisconsin Electric Company

1711 Dumore Bldg., Racine, Wisconsin

Sold in England by Canadian-American Machinery Co., Ltd., 8 Bouverie Street London, E.C., England.



That is a HANNIFIN Air Chuck

If your work requires quick handling and a rigid-slip grip, the chuck for the job is the "Hannifin" — increases output from 20 to 100 per cent.

At the Worthington Pump and Machinery Corporation's Hazelton, Pa., plant, Hannifin Air Chucks are in sole possession of the field. The machine photographed shows a 3″ Russian shell Hannifin-chucked for inside operations.

These chucks do their work under 75 pounds air pressure and "Aid greatly in speeding up production," says the master mechanic; for outside turning, shells are held on Hannifin Air Operated Mandrels with similar results.

In another busy shell department one operator reports an increase of ten 5″ shells per day through the change to Hannifin Chucking, and considerably less fatigue when the day's work is done.

Hannifin Chucks are doing important work on every shell making "front"—also in other lines of manufacture.

Catalog of Air Operated Chucking and Clamping Equipment on request.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

R. E. Ellis Engineering Company, Chicago, Ill.; Coats Machine Tool Co., New York City, N.Y.; Naumann-Firman Co., Detroit, Mich.; A. R. Williams Machinery Co., Toronto, Ont., Can.; A. R. Williams Machinery Co., Winnipeg, and St. John, N.B.; Williams & Wilson, Montreal, Quebec, Can.; Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick-Freres Company, 1500 Rue Fenelon, Paris, France; Iznosskoff & Co., Petrograd, Moscow, Ekaterinberg, and Odessa, Russia.

Operated Without Wrench

While in Motion

A Wrenchless Chuck is not an improvement on other methods. It is a decided departure in the manufacture of chucks that greatly decreases the operating time, increases production and can be depended upon at all times.

Simple in operation. Can be adjusted as quickly as a face plate. Strong and sturdy.

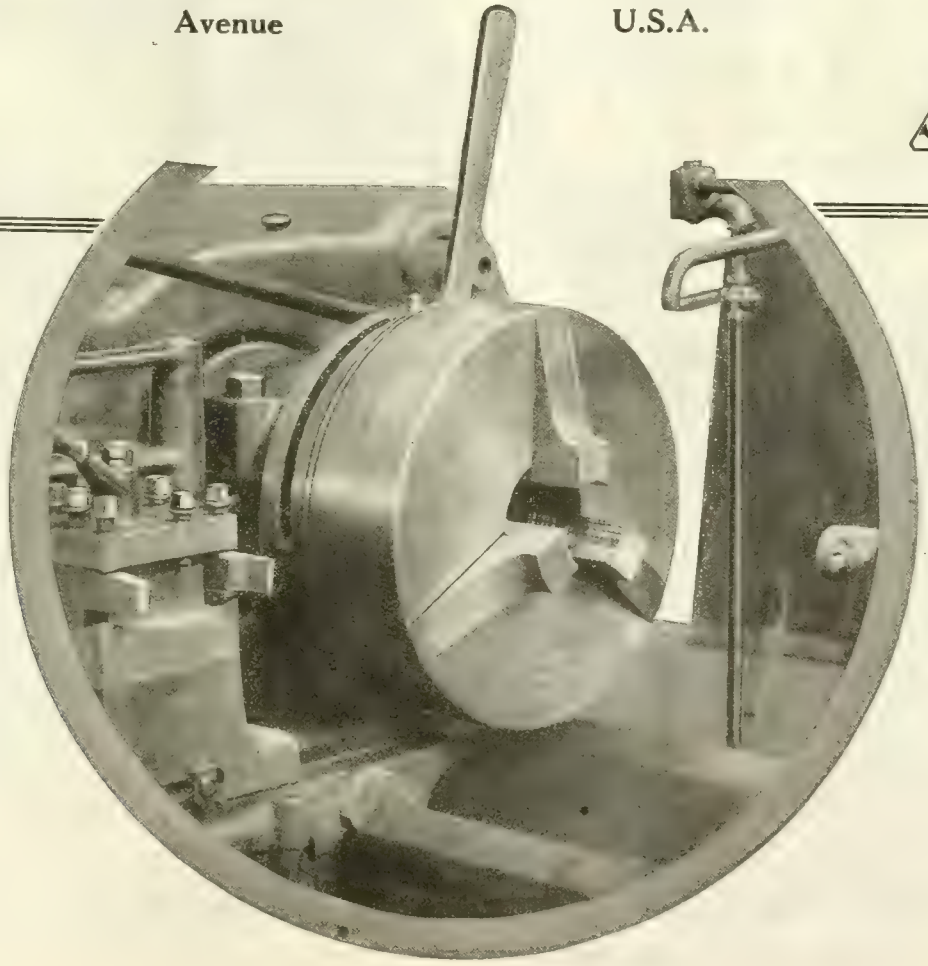
The operating mechanism is in the form of a planetary gear, enclosed within a casing which is carried and held central by the hub of the chuck. It is kept from rotating by means of a U-bar straddling the headstock.

In transmitting the movement from the cam to the jaws a leverage principle is involved which has as its object the elimination of the tremendous friction loss that is inherent in chucks where scrolls or similar wedging members are used.

Send for descriptive literature. We will gladly forward it to you.

Thomas Elevator Company

22 South Hoyne Avenue **Chicago, Ill. U.S.A.**



MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

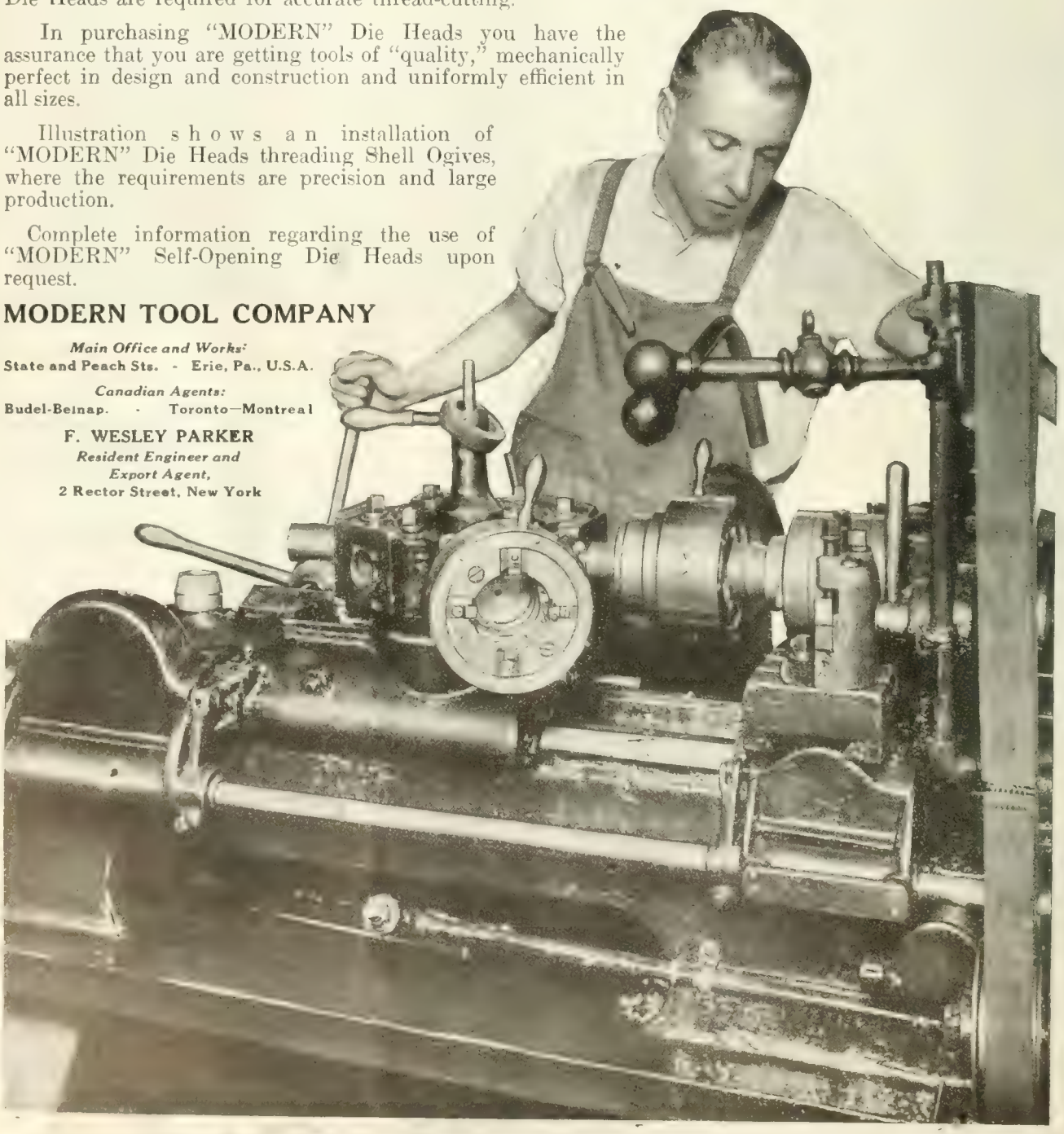
Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

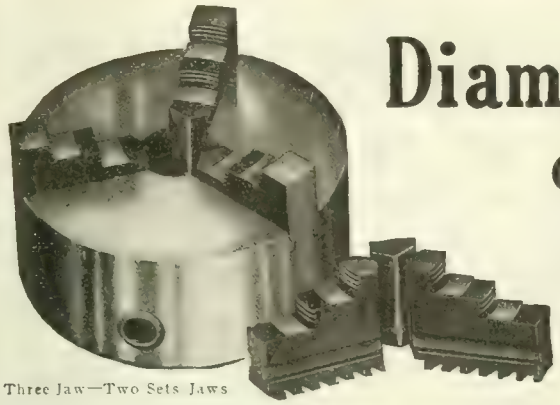
Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

Canadian Agents:
Budel-Belnap. - Toronto—Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York



Mention this paper when writing advertisers. It will identify the proposition about which you require information.



Three Jaw—Two Sets Jaws

Diamond R Chucks

GEARED SCROLL TYPE

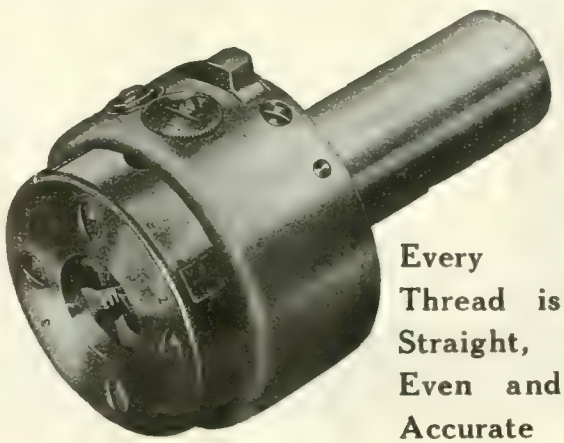
MADE BY

Richmond Manufacturing Co.

183-185 George Street, Toronto, Canada.

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.



Every Thread is Straight, Even and Accurate

The Chasers in an *H & G Automatic, Self-Opening Die Head* are set and held in place by a steel cam. That cam once adjusted, locks; there is no stoppage or changing in size.

The quick release not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required.

Simple, Strong and Compact.

Our booklet tells more. ***Drop a card for it.***

Eastern Machine Screw Corp.

New Haven, Conn.

Double-Quick Cutting-Off

THE HURLBUT-ROGERS CUTTING-OFF AND CENTERING MACHINE has the advantage of two cutting tools.

Each tool is rigidly supported in a stationary block at an angle which permits a strong shearing cut.

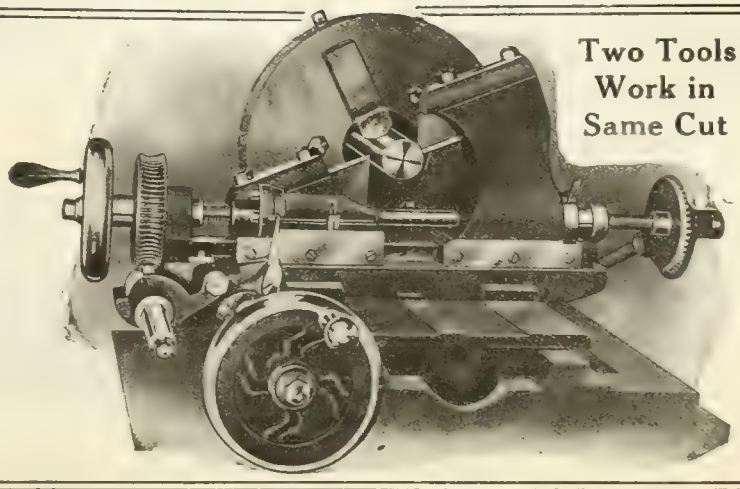
WITH THIS MACHINE PRODUCTION CAN BE NEARLY DOUBLED, and the utmost accuracy maintained under the hardest of work.

Read full details. Write for catalogue.

Hurlbut-Rogers Machinery Company

South Sudbury, Mass., U. S. A.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow, Newcastle-on-Tyne. H. W. Petrie, Toronto, Canada.



Two Tools Work in Same Cut

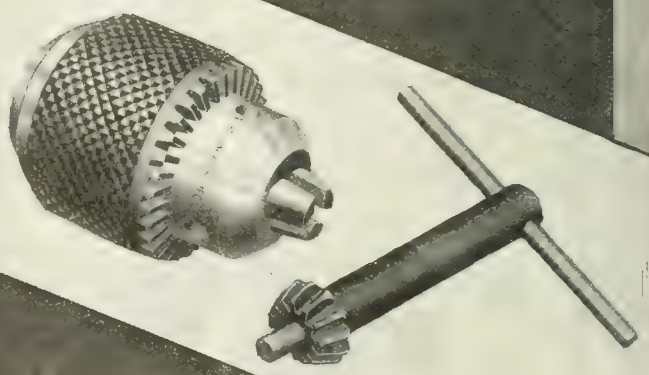
Jacobs IMPROVED Drill Chuck

A Winner By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Reducing the Thread Cutting Costs

NAMCO TAPS
COLLAPSING
"NO HOLE TOO DEEP"

The New NAMCO Positive Collapsing Tap offers an immediate solution to this high threading cost problem.
The NAMCO Tap differs from all other collapsible taps both in design and construction and features many advantages over the old style of tap, namely
—capacity for any depth hole.
—positive collapsing action.
—proper support for chasers while cutting.
—all operating mechanism within body.
The new catalog explaining in detail the reasons for the improvements claimed for NAMCO Collapsible Taps will be sent on request. Ask for "M."

(Capacities 1 1-4 inch up)

THE NATIONAL ACME COMPANY, CLEVELAND, OHIO
New England Plant: Windsor, Vermont **Canadian Plant: Montreal, P. Q.**

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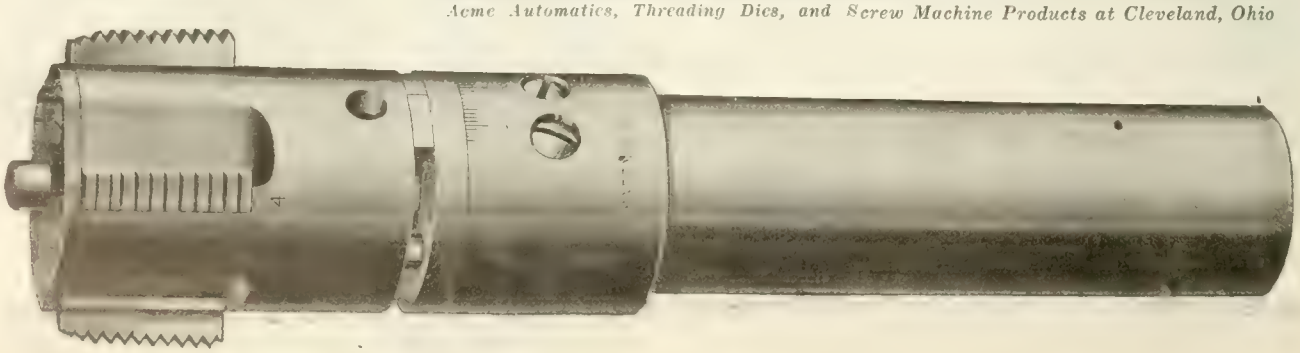
Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio



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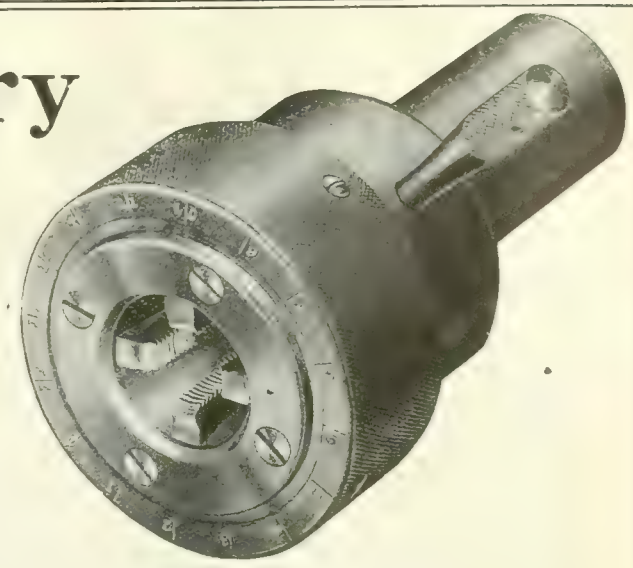
Users of Murchey Tools Get Chasers Without Delay

Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

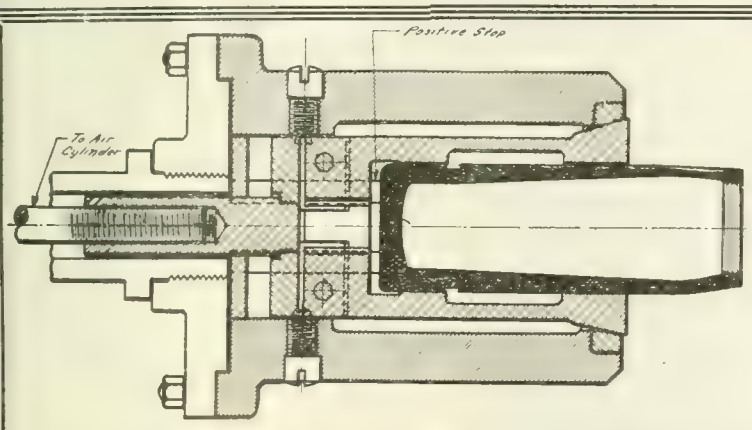


MURCHEY TAPS are accurate and simple and can be worked with great speed. On 4.5 Mark VII shells Murchey tapping time is just ONE MINUTE.

Murchey Machine & Tool Company

75 PORTER STREET - - DETROIT, MICHIGAN

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.



Consider Just This One Feature of M.E.C. Air-operated Hinged Collets

They save from 50 per cent. to 90 per cent. of the time usually required to do the same work by an ordinary chuck. While they possess many other points of superiority, the above feature alone is one that should appeal to users of chucks.

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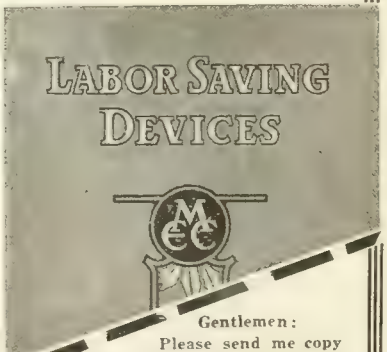

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If any advertisement interests you, tear it out now and place with letters to be answered.

MacLean's Magazine
FOR JULY

The Smugglers were Caught

THE true and complete story of a huge smuggling conspiracy which robbed the Canadian and United States Customs Departments of hundreds of thousands of dollars, and which was finally exposed by a Canadian Customs officer, is well told in the July MACLEAN'S. The parties concerned settled by handing over a huge check to the Canadian Government and not a word of the story has ever before been in print. The man who writes the article, J. D. Ronald, was personally concerned in the investigation, and he tells the whole case from first to last, merely changing the names of some of the central figures. This is one of the most striking special features that MACLEAN'S has ever had.

Confederation
the dominant theme of July MACLEAN'S

THE Jubilee of Confederation has led the Editor to make the July MACLEAN'S retrospective and interpretive of Confederation in the character of its main contents—this to meet the certain need and desire of the Canadian people. Note the fine provision of special Confederation article and features:

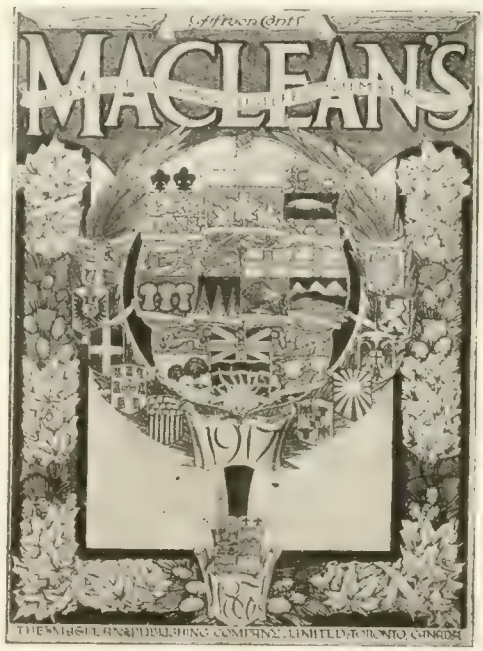
"THE MEETING OF MACDONALD AND BROWN."
By C. W. Jefferys, a frontispiece painted for MACLEAN'S.

"THE STORY OF CONFEDERATION."
By Thomas Bertram. A colorful narrative of the bringing about of the union of provinces.

"FIFTY YEARS OF BUSINESS EXPANSION."
By W. A. Craick, covering all phases of business—banking, insurance, manufacturing, agriculture, transportation, etc.

"THE BUILDING OF THE C.P.R."
By C. H. Mackintosh, former Lieutenant-Governor of the North West Territories, and an ex-editor of the Ottawa Citizen.

"CONFEDERATION AND AFTERWARDS."
By Agnes C. Laut. An article on Confederation and the taking over of the North West Territories from the Hudson Bay Company.



Look for this symbolic cover design in three colors at book stores and news-stands. It is a fine bit of work, and worth preserving.

"SOME CANADIAN CONTRASTS."
By Frank Yeigh. A sketchy article showing some of the most picturesque ways in which Canada has advanced during the last fifteen years.

"THE DRAFT."
By A. C. Allenson. A story of the part which Canadians took in the American Civil War.

MESSAGES ON CONFEDERATION
appear from the Premiers of many of the Provinces of Canada.

Billy Sunday Contributes:

"WHAT I THINK OF CANADA."
A brief article in the crisp, epigrammatical style of the famous evangelist, illustrated by some of his most recent photographs taken in action in New York.

The Fiction Features:

"THE GUN BRAND."
By James B. Hendryx. An interesting instalment of this exciting serial.

"THE OUTLAW BOAR."
By Clark E. Locke. A short story.

"PUTTING IT OVER."
By Hastings Webling. A golf story.

"THE CAPTAIN OF THE SUSAN DREW."
By Jack London. The first instalment of a two-part story—one of the last that London wrote.

The Best Number of MACLEAN'S

THAT has ever been put out is this July issue. It will be bigger, the articles are **by long odds** stronger, the stories more entertaining, and the illustrations more varied. Stephen Leacock's "Sunshine in Mariposa" is continued in this issue; also the regular Departments, Records of Success, Review of Reviews, The Business Outlook, and Information for Investors.

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Eliminate Danger

Accidents break down the efficiency of your organization, lead to legal troubles, loss of time and money.

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insure safety. They also protect themselves because of their patented construction. The dove-tailed design of wrench and screw contracts the metal under pressure. The harder you twist the wrench the more the metal of the screw is compressed.

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THE LARGEST ASSORTMENT Made By Any Manufacturer

The "New Model" is especially adapted to rapid, sensitive drilling. It is accurate, light, strong and hand operated.

The price is surprisingly low. Illustrations of complete line on request.

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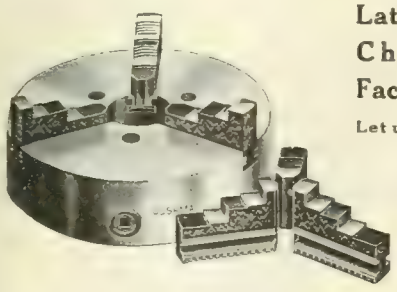
We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario

Cushman Chucks

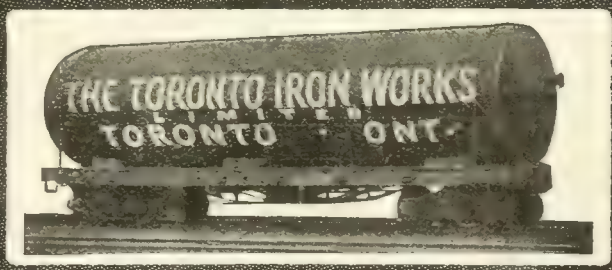


Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

RIVETED STEEL TANKS FOR EVERY PURPOSE



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PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
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CASTINGS

To any pattern

Manganese Bronze
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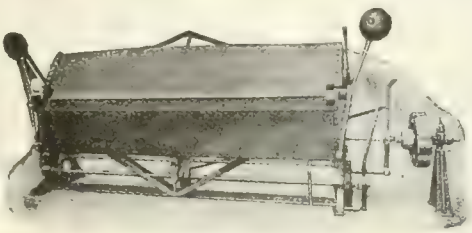
Chicago Steel Bending Brakes

We are exclusive Manufacturers of Steel Bending Brakes, and our product shows it.



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10 ft. for 10 Ga.

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IRON AND STEEL

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METAL WORKING MACHINERY

Call on our Rochester stock for 25" Sliding Drill Presses, 16" Shapers, Power Feed Milling Machines, Screw Machines, Engine Lathes, No. 6 Rivett Internal Grinder.

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HIGH SPEED STEEL

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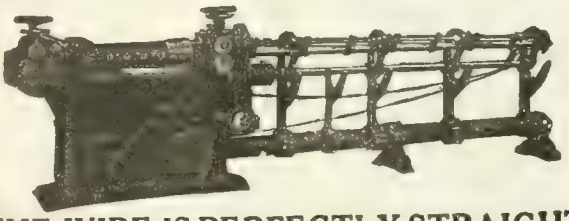

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and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.

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Formerly John Adt & Son. Established 1866.
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

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Exclusive Canadian Agents:
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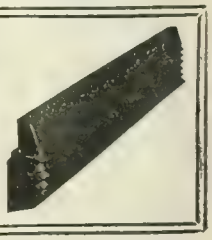

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In stock and to order any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

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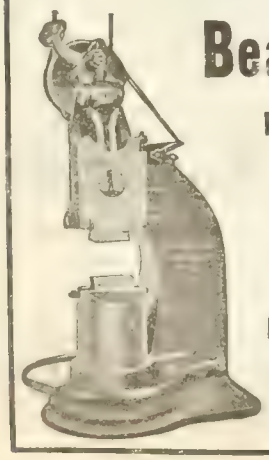

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"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

Write to-day.

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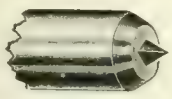

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For Truing Grinding Wheels

Francis Diamond Hand and Grinder Tools always give entire satisfaction. The diamonds in these tools are of the hardest and best quality and set very securely. Length of Hand Tool shown here 11½ in. over all. Rosewood handle. Let us send you an assortment for selection.

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You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS

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THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

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Armstrong Bros. Tool Co.

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The Asa S. Cook Company

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Rivet Machines

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Absolutely Accurate Automatic Feed

In sizes to work blanks up to 6 inches long, 7/16 in. diameter stock. Capacity from 80 to 200 rivets per minute, according to size.

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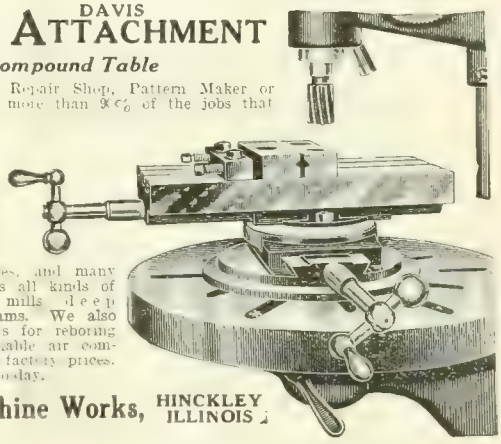

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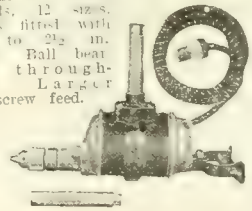

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Your second-hand machinery.

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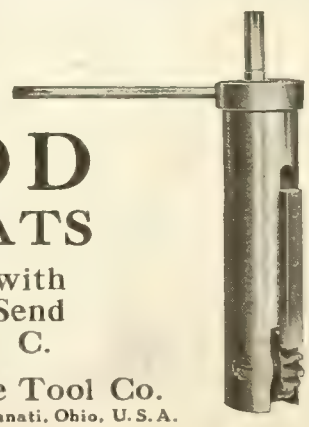

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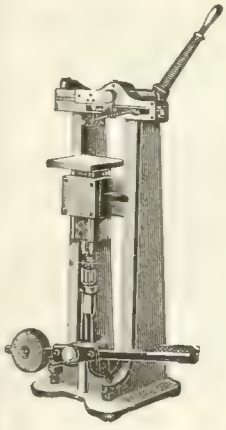

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Write for interesting printed matter.

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Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.
H. W. Petrie, Ltd., Montreal.
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Montreal, Que.
Dominion Machinery Co., Toronto.
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Montreal.
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

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Bertrams, Limited, Edinburgh, Scotland.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada.
Dominion Machinery Co., Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago.
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, O.

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Matthews, Jas. H., & Co., Pittsburgh, Pa.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Toronto Iron Works, Ltd., Toronto, Ont.

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Gray Mfg. & Mach. Co., Toronto, Ont.

BLOWERS
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Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

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L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Mulliner-Enlund Tool Co., Syracuse, N.Y.

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H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
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Canada Machinery Corp., Galt, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Foss & Hill Machy. Co., Montreal.
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Garlock-Walker Machinery Co., Toronto, Ont.
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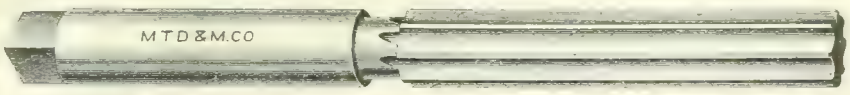

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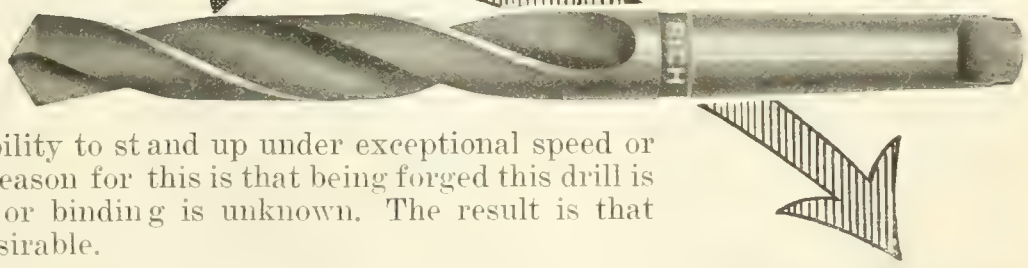

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Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
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De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
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Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
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Silver Mfg. Co., Salem, Ohio.
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Keystone Mfg. Co., Buffalo, N.Y.
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Aikenhead Hardware Co., Toronto, Ont.
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Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
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Pratt & Whitney Co., Dundas, Ont.
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United States Electrical Tool Co., Cincinnati.

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Morse Twist Drill & Machine Co., New Bedford
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Aikenhead Hardware Co., Toronto, Ont.
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Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Foss & Hill Machy. Co., Montreal.
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A. R. Williams Machy. Co., Toronto.

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Cleveland Twist Drill Co., Cleveland.
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Morse Twist Drill & Mach. Co., New Bedford.

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Clark Equipment Co., Buchanan, Mich.
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Morse Twist Drill & Mach. Co., New Bedford.
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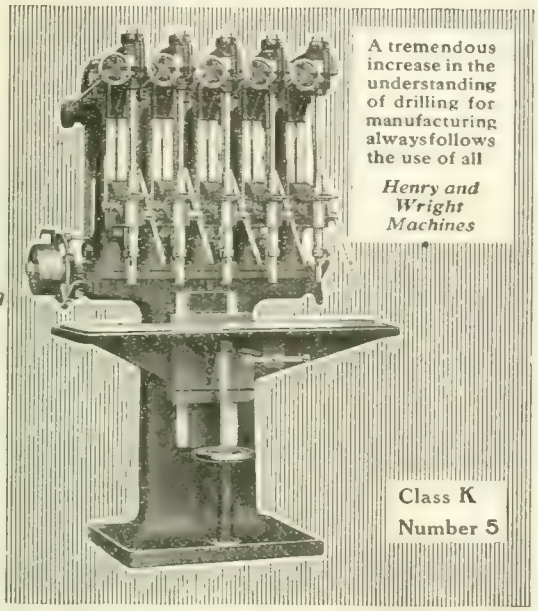

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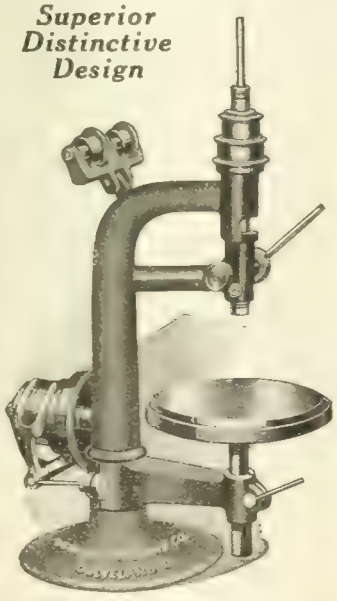

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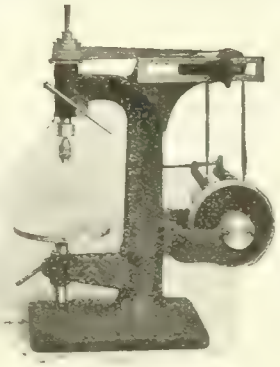

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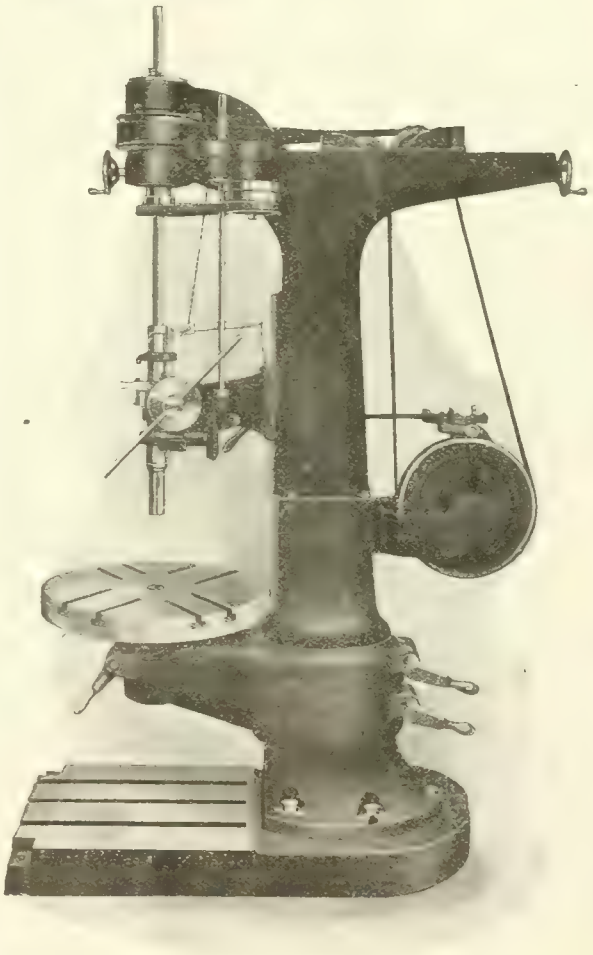

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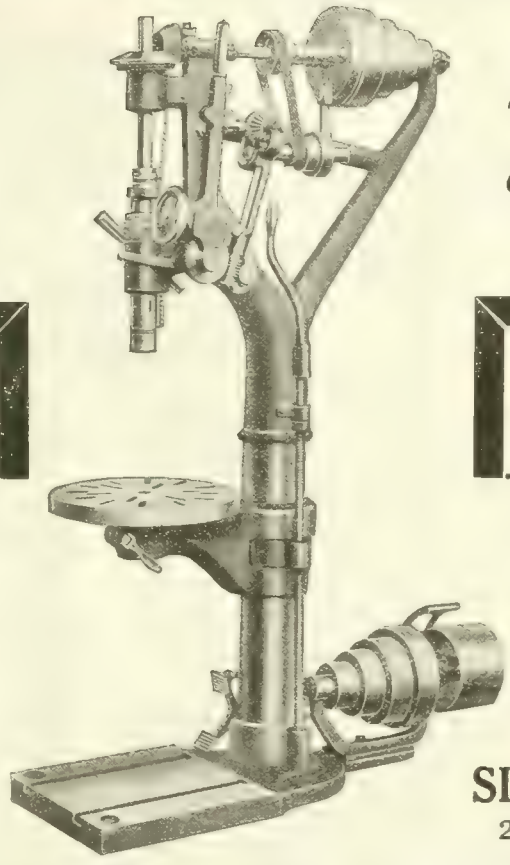

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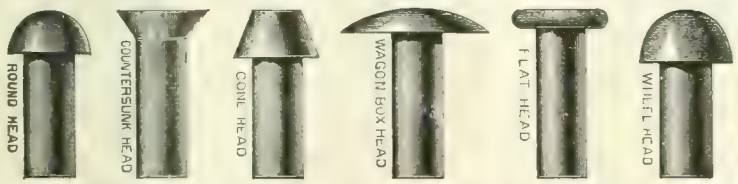

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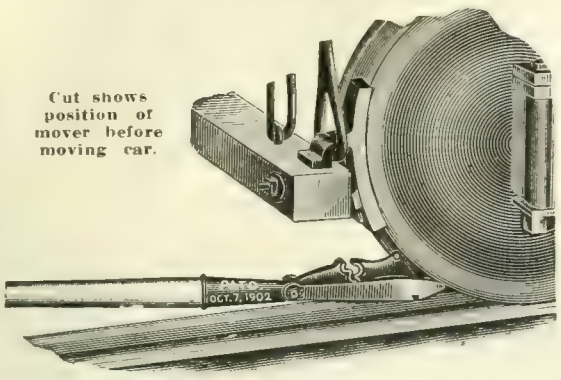

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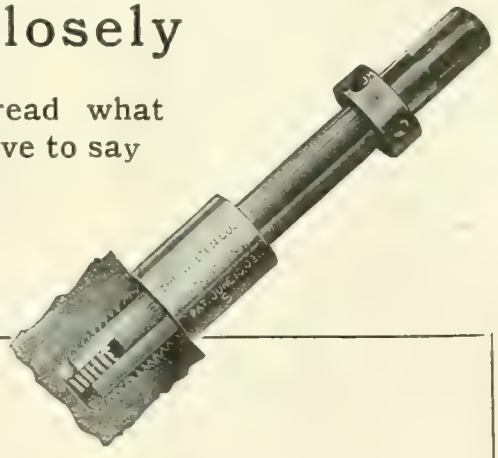
and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find this Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.

Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

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West Tire Setter Co., Rochester, N.Y.
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Grant Mfg. & Machine Co., Bridgeport, Conn.
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Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.
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Strong, Kennard & Nutt Co., Cleveland, Ohio
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Hungerford Brass & Copper Co., U. T., New York
Geo. H. Lees & Co., Hamilton, Ont.
SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont
SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Rhodes Mfg. Co., Hartford, Conn.
SMOKESTACKS.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford
J. H. Williams & Co., Brooklyn, N.Y.
SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Can.
SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Hungerford Brass & Copper Co., U. T., New York.
Tallman Brass & Metal Co., Hamilton.
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Baird Machine Co., Bridgeport, Conn.
Banfield, Edwin J., Toronto.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn
John H. Hall & Sons, Brantford.
Gray Mfg. & Mach. Co., Toronto, Ont.
Himoff Machine Co., New York, N.Y
Hyde Engineering Works, Montreal, Que.
Jardine, A. B., & Co., Hespeler.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont
Mulliter & Edlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto
Winnipeg Gear & Engr. Co., Winnipeg, Man.
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Barnes, Wallace, Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele Ltd., Guelph, Ont.
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Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.
SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn
Sleeper & Hartley, Inc., Worcester, Mass.
SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont
SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
SCREW SLOTTERS
Cook, Asa S., Co., Hartford, Conn.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
SECOND-HAND MACHINERY
Bath & Co., Cyril J., Cleveland, Ohio.
Davis Machine Tool Co., W. F., New York.
Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
Hill, Clarke & Co., Chicago, Ill.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York.
H. W. Petrie, Toronto.
Riverside Machy. Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.
SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.
SOLDER
Jobborn, Geo. A., Hamilton, Ont.
SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.
STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont
STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stpg. Co., Walkerville, Ont
Homer & Wilson, Hamilton, Ont.
STAMPING MACHINERY
Brown, Boggs & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.
STAMPS STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.
STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co , Montreal
Can. Morehead Mfg. Co., Woodstock, Ont.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
STEEL ALLOY (SEE ALLOY STEEL)
STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.
STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.
STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Comstedt, Josef F. A., 120 Broadway, N.Y.
Latrobe Electric Steel Co., Latrobe, Pa.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.
STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.
STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.
STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Comstedt, Josef F. A., 120 Broadway, N.Y.
H. A. Drury Co., Ltd., Montreal.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Geo. A., 70 Lombard, Toronto.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.
STEEL VANADIUM
Comstedt, Josef F. A., 120 Broadway, N.Y.
Drury, H. A., Co., Montreal, Que.
Michigan Steel Exchange, Inc., Detroit, Mich.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa.
STELLITE, HIGH-SPEED TOOL METAL
Can. B. K. Morton Co., Montreal, Que.
Deloro Smelting & Refining Co., Toronto, Ont.
STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.
STOCKS FOR DIES
Wells Bros. Co. of Canada, Galt, Ont.
STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
STOOLS, STEEL, SHOP
Dennis Wire & Iron Works, London, Canada.
New Britain Mach. Co., New Britain, Conn.
STRAIGHTENING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland
SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.
TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
TANKS, GASOLINE AND OIL
Dominion Forge & Stpg. Co., Walkerville, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
TANKS, STEEL, WATER PRESSURE
Can. Welding Works, Montreal, Que.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto.
TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon Holmes Co., Sherbrooke.
Toronto Iron Works Ltd., Toronto.
TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng
TAPPING MACHINES (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada Toronto
Greenfield Tap & Die Corp., Greenfield, Mass.
TAPPING MACHINES AND ATTACHMENTS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven, Conn.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven, Conn.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City.
THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.
TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.
THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Geometric Tool Co., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
THREADING TOOLS
Rivett Lathe & Grinder Co., Brighton, Mass.
THREAD MILLERS
Gray Mfg. & Mach. Co., Toronto, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont.
Peck, Stow & Wilcox, Cleveland, Ohio.
TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.
TOOL CASES
Union Tool Chest Works, Rochester, N.Y.
TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.
TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.
TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Geo. A., 70 Lombard, Toronto.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Ltd., Montreal.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machy. Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.
TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Cleveland, O.
Steel Bending Brake Works, Ltd., Chatham, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machy Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Mach. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St Louis, Mo
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Hungerford Brass & Copper Co., New York, N.Y.
Lyman Tube & Supply Co., Montreal, Que.
Standard Tube & Fence Co., Woodstock, Ont.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg Co., Providence, R.I.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Cook, Asa S., Co., Hartford, Conn.
A. B. Jardine & Co., Hespeler.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
A. R. Williams Machy Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Mach. Co., Hamilton.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
Hungerford Brass & Copper Co., New York, N.Y.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WATCHES, TIME STUDY
Silberberg, M. J., Chicago, Ill.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont
Sleeper & Hartley, Inc., Worcester, Mass.

WAVING AND UNDERCUTTING MACHINES AND ATTACHMENTS
Gray Mfg. & Mach. Co., Toronto, Ont.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Taber Mfg Co., Philadelphia, Pa
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welder Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene). SEE OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.
Hungerford Brass & Copper Co., U. T., New York.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE SOLDER
Hungerford Brass & Copper Co., U. T., New York.

WIRE, STEEL, BRASS, COPPER, BRONZE
Hungerford Brass & Copper Co., U. T., New York
Steel Co. of Canada, Ltd., Hamilton, Ont.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
New Britain Machine Co., New Britain, Conn.
Oliver Machy. Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. Co. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY, TAP
Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont

WRENCHES, RATCHET AND BASIN
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WIRE STRAIGHTENING AND CUTTING MACHINERY (AUTOMATIC)
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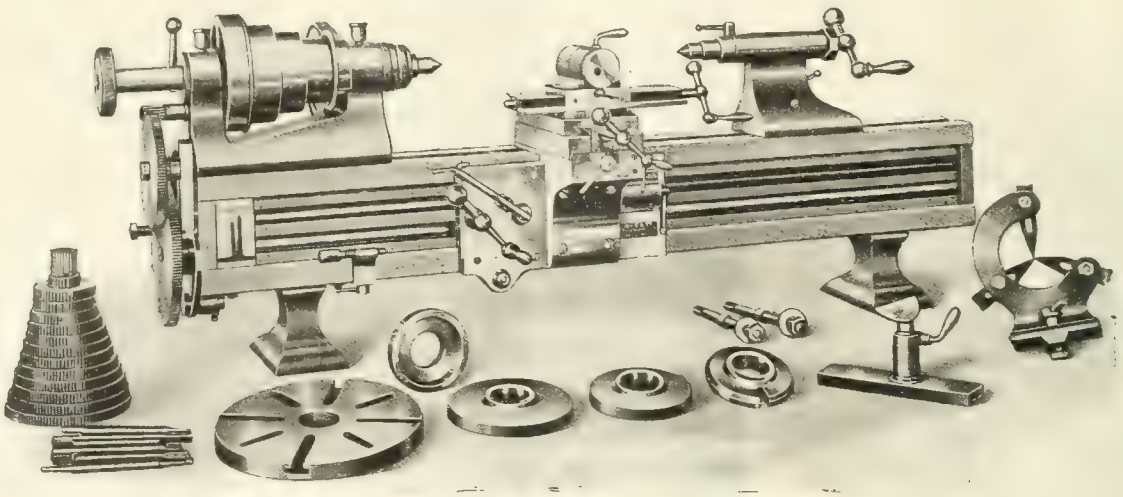

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A weekly newspaper devoted to the machinery and manufacturing interests.

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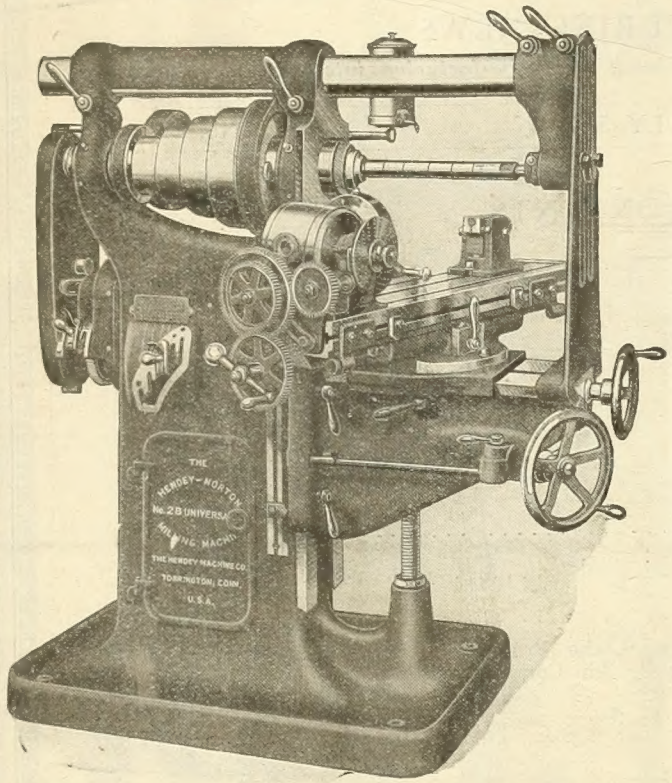

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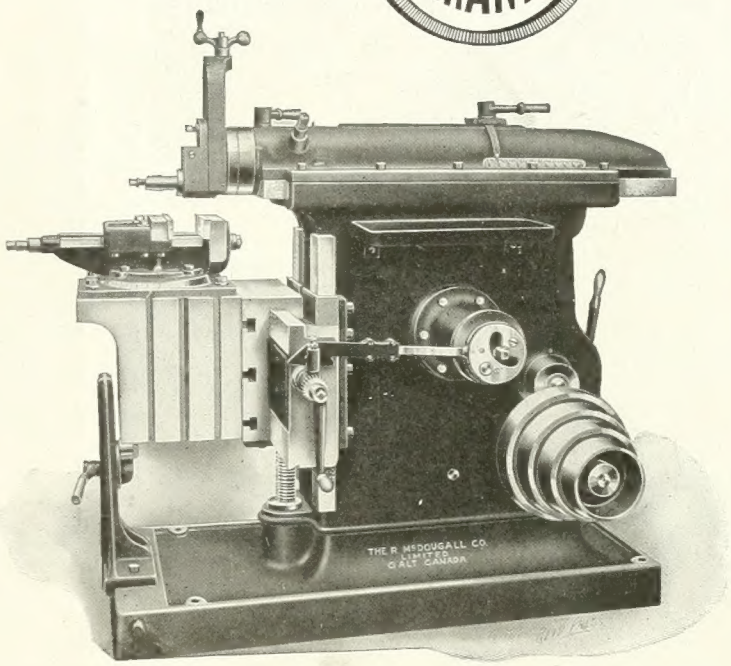

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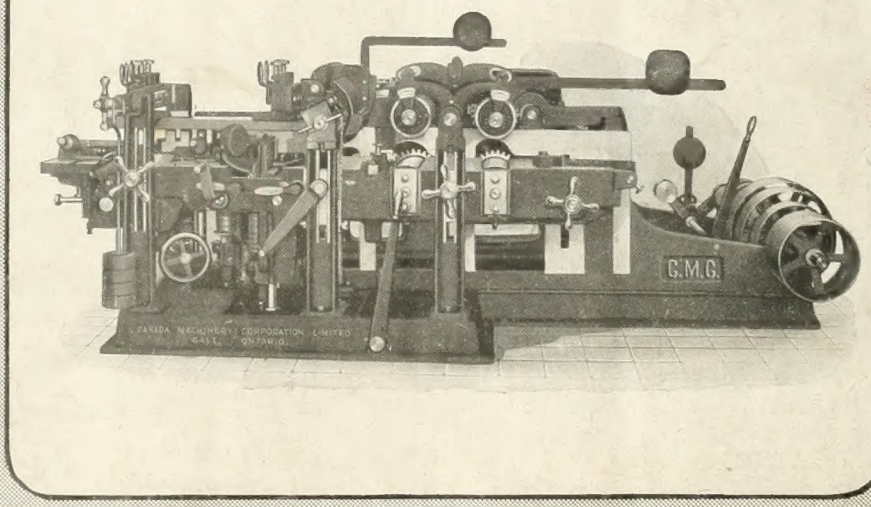

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